COURTNEY M. PRICE
VICE PRESIDENT
CHEMSTAR

American Chemistry Council
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December 12, 2001

Via US Mail and e-mail

Christine Todd Whitman, Administrator
U.S. Environmental Protection Agency (EPA)
P.O. Box 1473
Merrifield, VA 22116

Re: Rubber and Plastic Additives (RAPA) Panel, Consortium No.
HPV Chemical Challenge Program Submission
Thiuram Category
Category Justification, Testing Rationale, and Robust Summaries

Dear Governor Whitman:

The RAPA Panel of the American Chemistry Council is pleased to submit the subject documents to EPA's HPV Chemical Challenge Program (Program) as our test plan for a category covering two of the 39 chemicals RAPA is voluntarily sponsoring in the Program. The RAPA Panel includes the following member companies: Bayer Corporation, Ciba Specialty Chemicals Corporation, Crompton Corporation, Flexsys America L.P., The Goodyear Tire & Rubber Company, The Lubrizol Corporation, Noveon, Inc., R.T. Vanderbilt Company, Inc., and UOP, LLC.

In this submission, please find the *Category Justification and Testing Rationale* for the category *Thiurams*. Two chemicals in the category are sponsored in the Program, as listed in the following table:

RAPA Panel Thiuram Category Chemicals Sponsored in the US HPV Chemical Challenge Program	
CAS Number	Compound Name
137-26-8	tetramethyl thiuram disulfide
97-77-8	tetraethyl thiuram disulfide

In addition to the *Category Justification and Testing Rationale*, please also find attached robust summaries contained in IUCLID-formatted documents for the two sponsored chemicals in the category.

This submission is also being sent electronically to the following e-mail addresses:

Oppt.ncic@epa.gov
Chem.rtl@epa.gov

If you require additional information, please contact the RAPA Panel's technical contact, Dr. Anne P. LeHuray at (703) 741-5630 or *anne_lehuray@americanchemistry.com*.

Sincerely yours,

Courtney M. Price
Vice President, CHEMSTAR

Attachments

Cc: C. Auer, EPA/OPPT
B. Leczynski, EPA/OPPT
RAPA Panel (without attachments)
S. Russell, ACC (without attachments)

AR201-13348A

Thiuram Category Justification and Testing Rationale

CAS Registry Numbers **97-77-8 and 137-26-8**

Rubber and Plastic Additives Panel
American Chemistry Council
December 2001

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List of Member Companies in the Rubber and Plastic Additives Panel

The Rubber and Plastic Additives Panel of the American Chemistry Council includes the following member companies: Bayer Corporation, Ciba Specialty Chemicals Corporation, Crompton Corporation, Flexsys America L.P., The Goodyear Tire & Rubber Company, The Lubrizol Corporation, Noveon, R.T. Vanderbilt Company, Inc., and UOP, LLC.

Summary

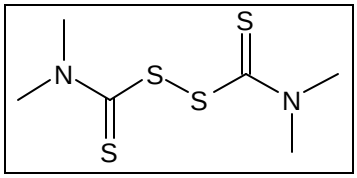
The member companies of the American Chemistry Council's Rubber and Plastic Additives Panel (RAPA) hereby submit for review and public comment their test plan for the thiurams under the Environmental Protection Agency's High Production Volume (HPV) Challenge Program.

The thiurams are used as primary accelerators in natural and synthetic rubbers. Their use in rubber products requires negligible water solubility, high organic/oil solubility, relatively low melting point and low vapor pressure. Existing data for members of this category indicate that they are of low concern for mammalian toxicity but toxic to aquatic organisms. The thiurams are biodegradable, so there is little concern for ecological persistence or bioaccumulation. They are of moderate concern for skin irritation and allergic skin reaction. We conclude that there are sufficient data on the members of this category to meet the requirements of the EPA High Production Volume Chemical Testing Program and no additional testing is recommended.

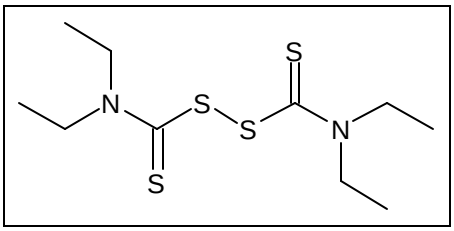
Thiuram category

As defined by EPA under the HPV Program, a chemical category is "a group of chemicals whose physicochemical and toxicological properties are likely to be similar or follow a regular pattern as a result of structural similarity." The similarities should be based on a common functional group, common precursors or breakdown products (resulting in structurally similar chemicals) and an incremental and constant change across the category. The goal of developing a chemical category is to use interpolation and/or extrapolation to assess chemicals rather than conducing additional testing.

Based on EPA's guidance document on "Development of Chemical Categories in the HPV Challenge Program,"[1] in which use of chemical categories is encouraged, the following chemicals constitute a chemical category:



tetramethyl thiuram disulfide
thiram
thioperoxydicarbonic diamide, tetramethyl-
137-26-8



tetraethyl thiuram disulfide
thioperoxydicarbonic diamide, tetraethyl-
97-77-8

Figure 1. Chemical structures

[1] US EPA, Office of Pollution Prevention and Toxics. Development of Chemical Categories, Chemical Right-to-Know Initiative. http://www.epa.gov/opptintr/chemrtk/categuid.htm

Structural Similarity. The materials in this category share the basic thiuram structure: two alkyl groups are attached to a nitrogen atom which in turn is attached to a molecule of carbon disulfide. Two of these molecules are attached to each other to form the thiuram disulfide.

Activity Similarity: The thiurams are fast-curing primary accelerators for natural and synthetic rubbers, speeding the formation of the sulfur crosslinks and donating sulfur to the rubber to form those cross-links. They are also secondary accelerators for thiazole and sulfenamide accelerators.

Both of these thiurams are used in agriculture as fungicides. Tetraethyl thiuram disulfide is also a prescription drug used in the treatment of alcoholism; its brand name is Antabuse (generic name disulfiram).

Common Precursors: The thiurams are manufactured from a secondary amine (dimethylamine or diethylamine) and carbon disulfide to form a dithiocarbamate; two of these dithiocarbamate molecules are attached to each other using an oxidizer such as hydrogen peroxide.

Common Breakdown Products: Both tetramethyl and tetraethyl thiuram disulfide degrade to their respective dithiocarbamates when exposed to heat or alkaline conditions.

Table 1. Physico-chemical Properties

Chemical **CAS#**	**tetramethyl thiuram disulfide** **137-26-8**	**tetraethyl thiuram disulfide** **97-77-8**
molecular weight	240.4	296.66
Melting Point	145 - 155° C (decomposes)	64° C
Boiling Point	129°C @ 20 mm Hg (decomposes)	117° C @ 17 mm Hg
Relative Density	1.3 – 1.4 g/cm3 @25°C	1.3 g/cm3
Vapour Pressure	2.3x10(-5)hPa @25°C	no data
Partition Coefficient (log Pow)	1.73	3.88
Water Solubility	30 mg/l @ 20°C	4.1 mg/l @ 25°C

Similarity of Physicochemical Properties. The similarity of the physicochemical properties of these materials parallels their structural similarity. Both are room-temperature solids with low vapor pressures, negligible water solubility, Log P values below 5, and subject to rapid hydrolysis.

Fate and Transport Characteristics. The thiurams decompose in water, especially under alkaline conditions. The presence or absence of light does not significantly alter the degradation rate, so additional photodegradation data collection studies are not proposed. These materials have been shown not to partition to water or air if released into the environment due to their low water solubility and low vapor pressure. Calculated Bioconcentration Factors and Log P values indicate that these materials are not Persistent Organic Pollutants (POPS). Additional computer-modeled environmental partitioning data is not proposed for the members of this category.

Toxicological Similarity. Existing published and unpublished test data for the thiurams demonstrate the similarity of the two compounds.

Aquatic Toxicology. The thiurams are toxic to algae, water fleas and fish. The 96-hour EC_{50} for algal growth inhibition is approximately 1 mg/l (1 ppm). The 48-hr EC_{50} for *Daphnia* is less than 0.3 ppm; the 96-hr LC_{50} for fish (bluegill) is approximately 0.1 ppm. Since acceptable data are available on both compounds, no additional ecotoxicity testing is proposed.

Acute Toxicity: Acute oral and dermal toxicity data are available for both compounds. The acute oral LD_{50} for TMTD is 1080 mg/kg; for TETD, approximately 1300 mg/kg. The acute dermal LD_{50} for TMTD is >2000 mg/kg; for TETD, 2050 mg/kg. The acute inhalation LC_{50} for TMTD is 4.4 mg/l. Acceptable data on two routes of exposure are available for both compounds. Given their structural and biological similarity we believe that the inhalation toxicity of TETD would closely resemble that of TMTD. Since acceptable data are available on both compounds, no additional acute toxicity testing is proposed for these materials.

Mutagenicity: Bacterial reverse mutation assays, *in vitro* and *in vivo* chromosome aberration studies, and other *in vitro* and *in vivo* genetic toxicity studies have been conducted on both TMTD and TETD. Positive and negative results have been observed in essentially all *in vitro* studies conducted on both compounds; further studies will not resolve this issue. The results of in vivo mutagenicity studies are uniformly negative. We conclude that the thiurams are weakly mutagenic when tested using *in vitro* methods and non-mutagenic using *in vivo* methods. Since acceptable data are available on both compounds, no additional mutagenicity testing is proposed for these materials.

Repeated Dose Toxicity: Several 90-day subchronic toxicity studies and a 2-year carcinogenicity study have been conducted on TMTD. A 90-day study and a 2-year carcinogenicity study have been conducted on TETD. These data are acceptable to characterize the subchronic and chronic toxicity of these compounds. In addition, TETD has been used as a human drug for several decades with few adverse effects reported. Since acceptable data are available on both compounds, no additional subchronic or chronic toxicity testing is proposed for these materials.

Reproductive and Developmental Toxicity: Developmental toxicity data are available for both materials; reproductive toxicity data are available for TMTD. The results of these studies show that neither compound is a selective or specific developmental or reproductive toxin. Since acceptable developmental toxicity data are available on both compounds and acceptable reproductive toxicity data are available on TMTD, no additional reproductive or developmental testing is proposed for these materials.

Conclusion: The physical, chemical and toxicological properties of the thiurams are similar and follow a regular pattern. Therefore, the EPA's definition of a chemical category has been met.

Test Plan: TMTD and TETD meet the EPA definition of a chemical category. Acceptable data on at least one member of the chemical category exist for acute toxicity, repeated dose toxicity, ecotoxicity, mutagenicity, reproductive toxicity and developmental toxicity. In the case of TETD, human data are also available due to its use as a prescription drug. A thorough and defensible hazard analysis and risk assessment can be made with the data available; additional animal studies would not significantly change what is already known about these two products.

We conclude that there are sufficient data on this category to meet the requirements of the EPA High Production Volume Challenge Program, and recommend no additional testing.

Table 2. Test Plan for the Thiuram Category

Test	tetramethyl thiuram disulfide 137-26-8	tetraethyl thiuram disulfide 97-77-8
Hydrolysis	A	C
Biodegradability	A	C
Photodegradation	A	C
Acute Fish Toxicity	A	A
Acute Invertebrate Toxicity	A	A
Alga Toxicity	A	A
Acute Toxicity	A	A
Mutagenicity – gene mutation	A	A
Mutagenicity – chromosome aberration	A	A
Repeated Dose	A	A
Reproductive Toxicity	A	C
Developmental Toxicity	A	A

Key for symbols in table:
A = Adequate data available
C = Use of Category Approach

Background Information: Manufacturing and Commercial Applications

Manufacturing

The thiuram rubber accelerators have been manufactured world wide for over 60 years. They are manufactured by batch rather than continuous process. Thiurams are manufactured by combining a secondary amine with carbon disulfide in alkaline aqueous solution, forming a dithiocarbamate salt. The salt is then oxidized, usually with hydrogen peroxide; two molecules of dithiocarbamate joining to form one molecule of thiuram.

Commercial Applications

The largest commercial use of the thiurams is as general purpose cure rate accelerators for natural and synthetic rubber vulcanization. Thiram accelerators are typically used at 0.5 to 2 parts accelerator per every 100 parts of rubber (phr).

Shipping/Distribution

Thiuram-based compounds are shipped extensively throughout the world from manufacturing plants located in North America, South America, Europe, and Asia.

Worker/Consumer Exposure

The vast majority of thiurams is used by the rubber industry, and most thiurams are sold to large industrial users as ingredients for their rubber compounding processes.

The rubber and plastics additives industry has a long safety record and only sophisticated industrial users handle these materials. These materials are available as pellets or powders; they are frequently treated with other materials to minimize dust generation. Most large industrial users also have mechanized materials handling systems, so exposure is minimal. The greatest potential for skin and inhalation exposure is at the packing station at the manufacturing site and, to a somewhat lesser degree during weighing activities at the customer site. Nuisance dust is the primary source of worker exposure.

Consumer exposure is minimal. Small amounts are used in rubber processing, and the materials themselves decompose or become bound in the rubber matrix during vulcanization. The most likely route of consumer exposure is skin contact from rubber or latex articles. Skin irritation, or possibly an allergic skin reaction may occur, but only in sensitive individuals subjected to prolonged and repeated exposure, especially under moist conditions.

TETD and TMTD are Regulated for Use in food-contact applications by the Food and Drug Administration:

> 21 CFR 177.2600 (Rubber Articles intended for Repeated Use): As accelerator, not to exceed 1.5% by weight of rubber product
>
> 21 CFR 175.105 (Adhesives): no limitations

TMTD (thiram) is an EPA-approved fungicide (40 CFR 180.132):

> Sec. 180.132 Thiram; tolerances for residues.
>
> Tolerances for residues of the fungicide thiram (tetramethyl thiuram disulfide) in or on raw agricultural commodities are established as follows:
> 7 parts per million in or on apples, celery, peaches, strawberries, tomatoes.
> 7 parts per million in or on bananas, (from preharvest and postharvest application) of which not more than 1 part per million shall be in the pulp after peel is removed and discarded.
> 0.5 part per million in or on onions (dry bulb).

TMTD is a restricted-use pesticide; it can be purchased and applied only by licensed professionals. It is not sold to the general public.

AR201-13348B

I U C L I D

D a t a S e t

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Existing Chemical	ID: 97-77-8
CAS No.	97-77-8
EINECS Name	disulfiram
EINECS No.	202-607-8
Molecular Formula	C10H20N2S4

Producer Related Part	
Company:	EUROPEAN COMMISSION - European Chemicals Bureau
Creation date:	11-FEB-2000
Substance Related Part	
Company:	EUROPEAN COMMISSION - European Chemicals Bureau
Creation date:	11-FEB-2000

Printing date:	28-SEP-2001
Revision date:	11-FEB-2000
Date of last Update:	11-FEB-2000

Number of Pages:	23

Chapter (profile):	Chapter: 1, 2, 3, 4, 5, 7
Reliability (profile):	Reliability: without reliability, 1, 2, 3, 4
Flags (profile):	Flags: without flag, confidential, non confidential, WGK (DE), TA-Luft (DE), Material Safety Dataset, Risk Assessment, Directive 67/548/EEC, SIDS

1.0.1 OECD and Company Information

Name: Akzo Nobel Chemicals b.v.
Street: Stationsplein 4, PO Box 247
Town: 3800AE Amersfoort
Country: Netherlands
Phone: +31-33-676767
Telefax: +31-33-676150
Telex: 79322

1.0.2 Location of Production Site
-

1.0.3 Identity of Recipients
-

1.1 General Substance Information

Substance type: organic
Physical status: solid

1.1.0 Details on Template
-

1.1.1 Spectra
-

1.2 Synonyms

1,1'-dithiobis(N,N-diethylthioformamide)
Source: Akzo Nobel Chemicals b.v. Amersfoort

antabus
Source: Akzo Nobel Chemicals b.v. Amersfoort

disulfiram
Source: Akzo Nobel Chemicals b.v. Amersfoort

ethyl thiram
Source: Akzo Nobel Chemicals b.v. Amersfoort

ethyl thiurad
Source: Akzo Nobel Chemicals b.v. Amersfoort

TETD
Source: Akzo Nobel Chemicals b.v. Amersfoort

tetraethylthiuram disulfide
Source: Akzo Nobel Chemicals b.v. Amersfoort

1.3 Impurities
-

1.4 Additives
-

1.5 Quantity
-

1.6.1 Labelling

Labelling:	as in Directive 67/548/EEC
Symbols:	Xn N E
Specific limits:	no data
R-Phrases:	(22) Harmful if swallowed (43) May cause sensitization by skin contact (48/22) Harmful: danger of serious damage to health by prolonged exposure if swallowed (50/53) Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment
S-Phrases:	(2) Keep out of reach of children (24) Avoid contact with skin (37) Wear suitable gloves (60) This material and/or its container must be disposed of as hazardous waste (61) Avoid release to the environment. Refer to special instructions/Safety data sets

1.6.2 Classification

Classification:	as in Directive 67/548/EEC
Class of danger:	corrosive
R-Phrases:	(22) Harmful if swallowed (48/22) Harmful: danger of serious damage to health by prolonged exposure if swallowed

Classification:	as in Directive 67/548/EEC
Class of danger:	dangerous for the environment
R-Phrases:	(50) Very toxic to aquatic organisms (53) May cause long-term adverse effects in the aquatic environment

Classification: as in Directive 67/548/EEC
Class of danger:
R-Phrases: (43) May cause sensitization by skin contact

1.7 Use Pattern
-

1.7.1 Technology Production/Use
-

1.8 Occupational Exposure Limit Values

Type of limit: MAC (NL)
Limit value: 2 mg/m3
Source: Akzo Nobel Chemicals b.v. Amersfoort
(1)

Type of limit: MAK (DE)
Limit value: 2 mg/m3
Short term expos.
Limit value: 20 mg/m3
Schedule: 30 minute(s)
Frequency: 1 times
Source: Akzo Nobel Chemicals b.v. Amersfoort
(2)

Type of limit: TLV (US)
Limit value: 2 mg/m3
Source: Akzo Nobel Chemicals b.v. Amersfoort
(3)

1.9 Source of Exposure
-

1.10.1 Recommendations/Precautionary Measures
-

1.10.2 Emergency Measures
-

1.11 Packaging
-

1.12 Possib. of Rendering Subst. Harmless
-

1.13 Statements Concerning Waste
-

1.14.1 Water Pollution
-

1.14.2 Major Accident Hazards
-

1.14.3 Air Pollution
-

1.15 Additional Remarks
-

1.16 Last Literature Search
-

1.17 Reviews
-

1.18 Listings e.g. Chemical Inventories
-

2.1 Melting Point

Value: > 64 degree C
Source: Akzo Nobel Chemicals b.v. Amersfoort
(4)

2.2 Boiling Point

Value: 117 degree C
Remark: at 17 mm Hg.
Source: Akzo Nobel Chemicals b.v. Amersfoort
(5)

2.3 Density

Type: density
Value: 1310 kg/m3 at 20 degree C
Source: Akzo Nobel Chemicals b.v. Amersfoort
(6)

Type: bulk density
Value: 340 - 380 kg/m3
Source: Akzo Nobel Chemicals b.v. Amersfoort
(7)

2.3.1 Granulometry
-

2.4 Vapour Pressure

Value:
Remark: Not applicable.
Source: Akzo Nobel Chemicals b.v. Amersfoort

2.5 Partition Coefficient
-

2.6.1 Water Solubility

Remark: Practically insoluble in water.
Source: Akzo Nobel Chemicals b.v. Amersfoort

2.6.2 Surface Tension
-

2.7 Flash Point
-

2.8 Auto Flammability
-

2.9 Flammability
-

2.10 Explosive Properties
-

2.11 Oxidizing Properties
-

2.12 Additional Remarks

Remark: The chemical forms chelates with certain metals, eg. Fe and Cu.¿
Source: Akzo Nobel Chemicals b.v. Amersfoort

3.1.1 Photodegradation

Type:
Method:
Year: GLP:
Test substance:
Remark: Based on structural relationship of TETD with tetramethylthiuramdisulfide (TMTD) the chemical is expected to have a relatively short halflife (approx. 20 days) at 300 to 750 nm.
Source: Akzo Nobel Chemicals b.v. Amersfoort

3.1.2 Stability in Water

Type:
Method:
Year: GLP:
Test substance:
Remark: If released in water TETD is expected to hydrolyze at a rate similar to that of its analog TMTD whose half-life is 2 days at pH7. In more alkline water at pH9 hydrolysis will occur much faster, with a half-life of 4 to 7 hours.
Source: Akzo Nobel Chemicals b.v. Amersfoort

3.1.3 Stability in Soil

Type: Radiolabel:
Concentration:
Cation exch. capac.
Microbial biomass:
Method:
Year: GLP:
Test substance:
Remark: As for the analof TMTD, TETD has a relatively short half-life in soil and no apparent leaching potential. The half-life ot TMTD in soil was measured to be approx. 43 days. It may photodegrade on the soil surface. In moist soil hydrolysis may occur (see 3.1.2).
Source: Akzo Nobel Chemicals b.v. Amersfoort

3.2 Monitoring Data (Environment)
-

3.3.1 Transport between Environmental Compartments

Type:
Media:
Air (Level I):
Water (Level I):
Soil (Level I):
Biota (L.II/III):
Soil (L.II/III):
Method:
Year:
Remark: With regard to transport between the compartments soil-water TETD is anticipated to behave similarly as its analog TMTD. TMTD has slight mobility through sand and low mobility through sandy loam, clay loam and Florida muck. Material is readily incorporated in soil matrix. Nelaching is not expected to occur. In soil biodegradation and abiotic degradation will occur (see 3.1 and 3.5).
Source: Akzo Nobel Chemicals b.v. Amersfoort

3.3.2 Distribution
-

3.4 Mode of Degradation in Actual Use
-

3.5 Biodegradation

Type:
Inoculum:
Method:
Year: GLP:
Test substance:
Remark: Like its analog tetramethylthiuram disulfide (TMTD), tetraethylthiuram disulfide is expected to be readily biodegradable. TMTD is completely mineralized in 28 days in a Closed Bottle Test.
Source: Akzo Nobel Chemicals b.v. Amersfoort
(8)

3.6 BOD5, COD or BOD5/COD Ratio
-

3.7 Bioaccumulation
-

3.8 Additional Remarks
-

AQUATIC ORGANISMS

4.1 Acute/Prolonged Toxicity to Fish

Type: semistatic
Species: Brachydanio rerio (Fish, fresh water)
Exposure period: 10 day
Unit: µg/l Analytical monitoring: no
Method: OECD Guide-line 204 "Fish, Prolonged Toxicity Test: 14-day Study"
Year: GLP: no data
Test substance: as prescribed by 1.1 - 1.4
Remark: Renewal of the test media after 2 days.
Results: NOEC survival: 3.2 ug/l
NOEC hatching: 3.2 ug/l
NOEC malformations: < 10 ug/l
Source: Akzo Nobel Chemicals b.v. Amersfoort
(9)

Type: semistatic
Species: Poecilia reticulata (Fish, fresh water)
Exposure period: 96 hour(s)
Unit: mg/l Analytical monitoring: no
LC0: .056
LC50: .187
LC100: .56
Method: OECD Guide-line 203 "Fish, Acute Toxicity Test"
Year: GLP: no data
Test substance: as prescribed by 1.1 - 1.4
Remark: Renewal of test medium at 48 hours.
Source: Akzo Nobel Chemicals b.v. Amersfoort
(10)

Type: semistatic
Species: Poecilia reticulata (Fish, fresh water)
Exposure period: 96 hour(s)
Unit: mg/l Analytical monitoring: no
LC50: .32
LC100: 1
Method: OECD Guide-line 203 "Fish, Acute Toxicity Test"
Year: GLP: no
Test substance: as prescribed by 1.1 - 1.4
Remark: Renewal of test media at 48 hours.
Source: Akzo Nobel Chemicals b.v. Amersfoort
(11)

4.2 Acute Toxicity to Aquatic Invertebrates
-

4.3 Toxicity to Aquatic Plants e.g. Algae
-

4.4 Toxicity to Microorganisms e.g. Bacteria
-

4.5 Chronic Toxicity to Aquatic Organisms

4.5.1 Chronic Toxicity to Fish
-

4.5.2 Chronic Toxicity to Aquatic Invertebrates
-

TERRESTRIAL ORGANISMS

4.6.1 Toxicity to Soil Dwelling Organisms
-

4.6.2 Toxicity to Terrestrial Plants
-

4.6.3 Toxicity to other Non-Mamm. Terrestrial Species
-

4.7 Biological Effects Monitoring
-

4.8 Biotransformation and Kinetics
-

4.9 Additional Remarks
-

5.1 Acute Toxicity

5.1.1 Acute Oral Toxicity

Type:	LD50
Species:	rat
Strain:	
Sex:	
Number of Animals:	
Vehicle:	
Value:	500 - 8600 mg/kg bw
Method:	
Year:	GLP: no data
Test substance:	no data
Remark:	Several LD50 studies are reported with results in the range of LD50: 500 to 8600 mg/kg
Source:	Akzo Nobel Chemicals b.v. Amersfoort

(12)

5.1.2 Acute Inhalation Toxicity

-

5.1.3 Acute Dermal Toxicity

Type:	LD50
Species:	rabbit
Strain:	
Sex:	
Number of Animals:	
Vehicle:	
Value:	> 2000 mg/kg bw
Method:	
Year:	GLP: no
Test substance:	as prescribed by 1.1 - 1.4
Source:	Akzo Nobel Chemicals b.v. Amersfoort

(13)

5.1.4 Acute Toxicity, other Routes

-

5.2 Corrosiveness and Irritation

5.2.1 Skin Irritation

Species: rabbit
Concentration:

Exposure:
Exposure Time:
Number of
Animals:
PDII:
Result: not irritating
EC classificat.: not irritating
Method: other: according to 49 CFR 173.240 (DOT, USA)
Year: GLP: no
Test substance: as prescribed by 1.1 - 1.4
Remark: Six rabbits were exposed for four hours to the test substance. In 48 hours observation no effects on the skin were observed.
Source: Akzo Nobel Chemicals b.v. Amersfoort

(14)

5.2.2 Eye Irritation

Species: rabbit
Concentration:
Dose:
Exposure Time:
Comment:
Number of
Animals:
Result: slightly irritating
EC classificat.: not irritating
Method:
Year: GLP: no
Test substance: as prescribed by 1.1 - 1.4
Remark: 0.1 gram test material was placed in the conjunctival sac of one eye of each of 6 rabbits, the other eye serving as control. In three of the treated animals the eye was washed 20-30 seconds after exposure, in the other animals the eyes remained unwashed.
No effects were observed in the washed eyes. The unwashed eyes showed the material to be slightly irritating only.
Source: Akzo Nobel Chemicals b.v. Amersfoort

(15)

Species: rabbit
Concentration:
Dose:
Exposure Time:
Comment:
Number of Animals:
Result: slightly irritating
EC classificat.: not irritating
Method: other: acc. to AFNOR
Year: 1982 GLP: no data
Test substance: no data
Remark: A 100 mg dose (ground to fine dust) was instilled into the conjunctival sac of one eye, the other eye serving as a control. Scorings were done at t=1 hour and t= 1, 2, 3, 4 and 7 days after instillation. Accroding to the scoring system of AFNOR (Association Francaise de Normalisation) the compouns was a slight eye irritant. All effects had practically disappeared at day 2.
Source: Akzo Nobel Chemicals b.v. Amersfoort

(16)

5.3 Sensitization

Type:
Species:
Number of Animals:
Vehicle:
Result:
Classification:
Method:
Year: GLP:
Test substance:
Source: Akzo Nobel Chemicals b.v. Amersfoort

5.4 Repeated Dose Toxicity

Species: rat Sex:
Strain:
Route of admin.: oral feed
Exposure period: 2 year
Frequency of treatment: daily
Post. obs. period:
Doses: 100, 300, 1000 and 2500 mg/kg diet
Control Group:
Method:
Year: GLP: no data
Test substance: no data
Remark: Doses given correspond to 5, 15, 50 and 125 mg/kg body weight. Test material was administered via the food. Gross and microscopic effects and effects on growth and mortality were seen at the highest level. Lower dosages showed some effect on growth.
No further details were given.
Source: Akzo Nobel Chemicals b.v. Amersfoort

(17)

5.5 Genetic Toxicity 'in Vitro'

Type: Ames test
System of testing: TA1535, TA1537, TA1538, TA98, TA100
Concentration: 10 to 100 ug/plate
Cytotoxic Conc.:
Metabolic activation: with and without
Result: negative
Method: other: acc. to Ames et al.
Year: 1975 GLP: no data
Test substance: no data
Source: Akzo Nobel Chemicals b.v. Amersfoort

(18)

Type: Ames test
System of testing: TA98, TA100, TA1535, TA1537, TA1538
Concentration: 0.5 up to 5000 ug/plate
Cytotoxic Conc.:
Metabolic activation: with and without
Result: negative
Method: other: according to Ames et al
Year: 1975 GLP: no
Test substance: as prescribed by 1.1 - 1.4
Source: Akzo Nobel Chemicals b.v. Amersfoort

(19)

Type: Ames test
System of testing: TA1535, TA100, TA1538, TA98, TA1537, TA97
Concentration: up to 330 ug/plate
Cytotoxic Conc.:
Metabolic activation: with and without
Result: negative
Method: other: according to Ames et al.
Year: 1975 GLP: no
Test substance: as prescribed by 1.1 - 1.4
Source: Akzo Nobel Chemicals b.v. Amersfoort
(20)

Type: Mammalian cell gene mutation assay
System of testing: L5178Y mouse lymphoma cells
Concentration: 0.0006 to 4.1 ug/ml
Cytotoxic Conc.:
Metabolic activation: without
Result: positive
Method: other: no information
Year: GLP: no data
Test substance: no data
Remark: No details on the method used and on the test substance used.
Source: Akzo Nobel Chemicals b.v. Amersfoort
(21)

Type:
System of testing:
Concentration:
Cytotoxic Conc.:
Metabolic activation:
Result:
Method:
Year: GLP:
Test substance:
Remark: In the NTP or NCI programs the following in vitro genetic toxicity data were referenced:
Ames test: negative
Sister Chromatid Exchange: negative
Chromosome aberrations: positive, however details on the test method employed (cell type, concentrations etc) were not given.
Source: Akzo Nobel Chemicals b.v. Amersfoort

5.6 Genetic Toxicity 'in Vivo'

Type: Cytogenetic assay
Species: rat Sex: female
Strain: Wistar
Route of admin.: other: two groups oral feed and one group oral gavage
Exposure period: 5 days (low and mid dose group), once (high dose group)
Doses: 350, 750 mg/kg/day (feed) and 3300 mg/kg/day (gavage)
Result:
Method: other
Year: GLP: no data
Test substance: no data
Remark: Animals were killed 24 hours after treatment. Minimum of 100 metaphases were scored per animal. Concluded to be non-clastogenic.
Source: Akzo Nobel Chemicals b.v. Amersfoort (22)

Type: Drosophila SLRL test
Species: Drosophila melanogaster Sex:
Strain:
Route of admin.:
Exposure period:
Doses: 3.7-12.3 mg/ml
Result:
Method:
Year: GLP:
Test substance:
Remark: No details given. Test material was negative, when tested up to 9 days after the treatments.
Source: Akzo Nobel Chemicals b.v. Amersfoort (23)

Type: Drosophila SLRL test
Species: Drosophila melanogaster Sex:
Strain:
Route of admin.:
Exposure period:
Doses:
Result:
Method:
Year: GLP:
Test substance:
Remark: Result: negative. No further details (eg. concentrations) were given.
Source: Akzo Nobel Chemicals b.v. Amersfoort

Type: Micronucleus assay
Species: mouse Sex: male/female
Strain: Balb/c
Route of admin.: oral unspecified
Exposure period: single dose
Doses: 625, 1250, 2500 mg/kg body weight
Result:
Method: other: not specified
Year: 1993 GLP: no data
Test substance: no data
Remark: There was no genotoxic respons in the bone marrow of animals of all test groups sampled 24 or 48 hours after dosing.
Source: Akzo Nobel Chemicals b.v. Amersfoort

(24)

5.7 Carcinogenicity

Species: rat Sex: male/female
Strain: Fischer 344
Route of admin.: oral feed
Exposure period: 107 weeks
Frequency of treatment: daily
Post. obs. period: 107 weeks
Doses: 0, 300 or 600 ppm
Result:
Control Group: yes, concurrent no treatment
Method:
Year: GLP: no data
Test substance: other TS
Remark: Mortality in the dosed animals was not significantly affected by the test chemical. No tumors occurred in the rats of either sex at incidences that were significantly higher than in the control group. It was concluded that the test material is not carinogenic to F344 rats.
Source: Akzo Nobel Chemicals b.v. Amersfoort
Test substance: Test substance was reported to be tetraethylthiuram-disulfide technical-grade.

(25)

Species: mouse Sex: male/female
Strain: B6C3F1
Route of admin.: oral feed
Exposure period: 108 weeks
Frequency of treatment: daily
Post. obs. period:
Doses: 0, 100, 500, 2000 ppm
Result:
Control Group: yes, concurrent no treatment
Method:
Year: GLP: no data
Test substance: other TS
Remark: Dose groups consisted of 50 male and 50 female animals. Females were dose 0, 100 or 500 ppm whereas the males were dosed 0, 500 or 2000 ppm. The control group consisted of 20 male and 20 female animals. All surviving animals (65%) were killed at the end of the treatment period. No tumors occurred at incidences significantly different form the controls. The test material was concluded to be non-carcinogenic.
Source: Akzo Nobel Chemicals b.v. Amersfoort
Test substance: Technical-grade test material was mentioned to be used.

(26)

Species: Sex:
Strain:
Route of admin.:
Exposure period:
Frequency of treatment:
Post. obs. period:
Doses:
Result:
Control Group:
Method:
Year: GLP:
Test substance:
Remark: A study was conducted in which Sodium nitrite and TETD alone and a mixture of 0.1% TETD and 0.2% sodium nitrite were administered to Fisher F344 rats for 78 weeks via their diet. Each group consisted of 20 male and 20 female animals.

The rats fed either TETD or sodium nitrite alone did not develop any tumors. Of the animals fed the mixture 10 males and 12 females developed tumors of oesophagus, tongue, squamous stomach or nasal cavity. The author did not attribute the tumors to the separate chemicals but to the reaction of TETD and sodium nitrite in the stomach to nitrosodiethylamine, a nitrosamine which also gave rise to tumors when administered as such.
Source: Akzo Nobel Chemicals b.v. Amersfoort

(27)

5.8 Toxicity to Reproduction

-

5.9 Developmental Toxicity/Teratogenicity

Species:	rat	Sex:	female
Strain:	Sprague-Dawley		
Route of admin.:	gavage		
Exposure period:	day 3 to 21 of gestation		
Frequency of treatment:	once daily		
Duration of test:			
Doses:	250 mg/kg bodyweight		
Control Group:	no data specified		
NOAEL Maternalt.:	> 250 mg/kg bw		
NOAEL Teratogen.:	> 250 mg/kg bw		
Method:	other		
Year:		GLP:	no data
Test substance:	no data		
Remark:	The test group only consisted of 4 animals. The test dose (250 mg/kg bw/day) did not cause maternal toxicity. There were no teratogenic effects seen.		
Source:	Akzo Nobel Chemicals b.v. Amersfoort		

Species:	mouse	Sex:	female
Strain:	CD-1		
Route of admin.:	gavage		
Exposure period:	days 6-13 of gestation		
Frequency of treatment:	once per day		
Duration of test:			
Doses:	4900 mg/kg/day		
Control Group:	no data specified		
NOAEL Maternalt.:	> 4900 mg/kg bw		
NOAEL Teratogen.:	> 4900 mg/kg bw		
Method:			
Year:		GLP:	no data
Test substance:	no data		
Remark:	50 Mice were dosed with the test material in this study and observations were made on litter size, birth weight, neonatal growth, survival of pups and developmental toxicity. No effects in the treated dams or offspring were observed.		
Source:	Akzo Nobel Chemicals b.v. Amersfoort		

(28)

5.10 Other Relevant Information

Type:	other
Remark:	Classified by IARC in Groups 3 'not classifiable as to its carcinogenicity to humans', 1987.
Source:	Akzo Nobel Chemicals b.v. Amersfoort

5.11 Experience with Human Exposure

Remark: Alcohol intolerance may occur after exposure to dithiocarbamates.
Cases of contact allergy have been reported in literature. Tetraethylthiuram disulfide has been used in the treatment of alcoholism. Articles discussing TETD-, or also called Disulfiram- or Antabuse-, treatment have been published in scientific literature. These studies however are not taken into account for this existing chemicals dossier as they do not reflect occupational situations and because in alcohol therapy therapeutically high doses are used, which do not reflect occupational circumstances. Next to this, in these studies, combination effects of TETD and alcohol cannot be ruled out.

Source: Akzo Nobel Chemicals b.v. Amersfoort

(1) De Nationale MAC-lijst, the Netherlands, 1994.

(2) DFG, MAK- und BAT-Werte Liste, Germany, 1994.

(3) 8 hour twa-TLV. ACGIH, USA, 1994-1995.

(4) Akzo Nobel Chemicals bv, MSDS, 1995.

(5) The Merck Index, 1989, p.531

(6) Akzo Nobel Chemicals, MSDS 1995.

(7) Akzo Nobel Chemicals MSDS, 1995

(8) A ready biodegradability study (Closed Bottle Test) for tetramethylthiuram disulfide (TMTD) is available. Akzo Chemicals report, Akzo Research Arnhem, report CRL F92073, 1992.

(9) Akzo Research Laboratories Arnhem, the Netherlands. Report nr. CRL F19019, 1991. Toxicity studies with dithiocarbamates and related substances on Poecilia reticulata and Brachydanio rerio.

(10) Akzo Research Laboratories Arnhem, Netherlands, Report no. CRL F91019, 1991. Toxicity studies with dithiocarbamates and related substances on Poecilia reticulata and Brachydanio rerio.

(11) Akzo Research Laboratories Arnhem, the Netherlands, Report nr. CRL F91019, 1991. Toxicity studies with dithiocarbamates and related substances on Poecilia reticulata and Brachydanio rerio.

(12) Sources:
RTECS, Registry of Toxic Effects of Chemical Substances. Search 06-feb-95.
HSDB, Hazardous Substances Data Bank, Search 06-feb-95.

(13) Pennwalt Corporation (now Akzo Nobel Chemicals) unpublished data. Pharmacology Research Inc. report 7/30/77.

(14) Pennwalt Corporation (currently Akzo Nobel Chemicals) unpublished data. Pharmacology Research Inc. report 7/30/77.

(15) Pennwalt Corporation (now Akzo Nobel Chemicals) unpublished data. Pharamcology Research Inc. report nr. 7/30/77.

(16) Guillot, J.P. at al.. Fd. Chem. Toxic. 20, 573-582, 1982.

(17) McCormick, W.e., Rubber Chemistry and Technology, 44, 512-533, 1971.

(18) Hedenstedt, A. et al., Mutation Research 68, 313-325, 1979. Hemminki,K. et al., Arch. Toxicol. 46, 277-285, 1980.

(19) Akzo Chemicals unpublished data, Litoon Bionetics report 20998, 1979.

(20) Akzo Chemicals unpublished data, Notox report ES 62/82.5, 1982.

(21) McGregor, D.B. et al. Respones of the L5178Y mouse lyphoma fromwar mutation assay. V: 27 coded chemicals. Environ. Mol. Mutagen. Vol.17, Iss.3, 196-219, 1991.

(22) Cobon, A.M. et al., Methods Find Exp Clin Pharmacol. 4 (8), 559-562 (1982) In HSDB (Hazardous Substances Data Bank) search 07/02/95.

(23) Donner, M. et al., Scand. J. Work Environ. Health, 9, suppl. 2, 27-37, 1983.

(24) Env. Mol. Mut. 21 supplement 22, 1993.

(25) National Toxicology Program. Bioassay of Tetraethylthiuram disulfide for possible carcinogenicity. 1979. Technical report series no. 166. DEHW-NIH publication no 79-1722.

(26) NTP. Bio-assay of tetraethylthiuram disulfide for possible carcinogenicity. Technical report series no 166. DHEW-NIH publication 79-1722, 1979.

(27) Lijinski, W. and Reuber, M.D. Tumors in duced in Fisher 344 rats by feeding of disulfiram together with sodium nitrite. Food Cosmet. Toxicol., 18 (1), 85-87, 1980.

(28) Hardin H.B. et al., Teratog Carcinog Mutagen. 7, 29-48, 1987.

7.1 End Point Summary

-

7.2 Hazard Summary

-

7.3 Risk Assessment

-

I U C L I D

D a t a S e t

Existing Chemical	ID: 137-26-8
CAS No.	137-26-8
EINECS Name	thiram
EINECS No.	205-286-2
TSCA Name	Thioperoxydicarbonic diamide ([(H2N)C(S)]2S2), tetramethyl-
Molecular Formula	C6H12N2S4

Producer Related Part

Company:	EUROPEAN COMMISSION - European Chemicals Bureau
Creation date:	11-FEB-2000

Substance Related Part

Company:	EUROPEAN COMMISSION - European Chemicals Bureau
Creation date:	11-FEB-2000

Printing date:	28-SEP-2001
Revision date:	11-FEB-2000
Date of last Update:	11-FEB-2000

Number of Pages:	108

Chapter (profile):	Chapter: 1, 2, 3, 4, 5, 7
Reliability (profile):	Reliability: without reliability, 1, 2, 3, 4
Flags (profile):	Flags: without flag, confidential, non confidential, WGK (DE), TA-Luft (DE), Material Safety Dataset, Risk Assessment, Directive 67/548/EEC, SIDS

1.0.1 OECD and Company Information

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Country: Germany

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Telefax: 02/640.98.60

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Town: 9000 Gent
Country: Belgium
Phone: 32 9 254 14 10
Telefax: 32 9 254 14 11
Telex: 11235

1.0.2 Location of Production Site
-

1.0.3 Identity of Recipients
-

1.1 General Substance Information

Substance type: inorganic
Physical status: solid

Substance type: organic
Physical status: solid

1.1.0 Details on Template
-

1.1.1 Spectra
-

1.2 Synonyms

a: Thiuram
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen

aa: Fernacol
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen

ab: Fernasan
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen

ac: Fernasan A
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen

ad: Fernide
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen

ae: Flo Pro T Seed Protectant
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen

af: FMC 2070
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen

ag: Formamide, 1,1'-dithiobis(N,N-dimethylthio-
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen

ah: Hermal
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen

ai: Hermat TMT
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen

aj: Heryl
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen

ak: Hexathir
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen

al: Kregasan
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen

am: Mercuram
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen

an: Methyl thiram
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen

ao: Methyl thiuramdisulfide
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen

ap: Methyl tuads
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen

aq: Micropearls
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen

ar: Nobecutan
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen

as: Nomersan
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen

at: Normersan
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen

au: Panoram 75
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen

av: Polyram ultra
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen

aw: Pomarsol
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen

ax: Pomarsol forte
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen

ay: Pomasol
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen

az: Puralin
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen

b: Thioperoxydicarbonicdiamide, tetramethyl-
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen

ba: Radothiram
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen

bb: RCRA waste number U244
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen

bc: Rezifilm
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen

bd: Royal TMDT
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen

be: Sadoplon
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen

bf: Spotrete
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen

bg: Spotrete-F
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen

bh: SQ 1489
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen

bi: Tersan
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen

bis(dimethylthiocarbamoyl)disulfide
Source: UCB-Chemicals Gent

Bis(dimethylthiocarbamoyl)disulfide
Source: Akzo Nobel Chemicals GmbH Dueren

bis(dimethylthiocarbamy)disulfide
Source: UCB-Chemicals Gent

bis(dimethylthiocarbamyl)disulfide; tetramethylthiuram bisulfide; N,N,N',N'-
Source: UCB CHEMICALS BRUSSELS

bj: Tersan 75
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen

bk: Tetramethyldiurane sulphite
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen

bl: Tetramethylenethiuram disulphide
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen

bm: Tetramethylthiocarbamoyldisulphide
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen

bn: Tetramethylthioperoxydicarbonic diamide
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen

bo: Tetramethylthioramdisulfide
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen

bp: Tetramethyl-thiram disulfid
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen

bq: Tetramethylthiuam bisulphide
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen

br: Tetramethylthiuramdisulfid
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen

bs: Tetramethylthiuram disulfide
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen

bt: Tetramethylthiuram disulphide
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen

bu: N,N-Tetramethylthiuram disulphide
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen

bv: N,N,N',N'-Tetramethylthiuram disulfide
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen

bw: Tetramethylthiuran disulphide
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen

bx: Tetramethyl thiurane disulfide
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen

by: Tetramethyl thiurane disulphide
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen

bz: Tetramethylthiurum disulfide
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen

c: Accelerator thiuram
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen

ca: Tetramethylthiurum disulphide
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen

cb: Tetrapom
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen

cc: Tetrathiuram disulfide
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen

cd: Tetrathiuram disulphide
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen

ce: Thillate
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen

cf: Thimer
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen

cg: Thioknock
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen

ch: Thiosan
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen

ci: Thiotox (fungicide)
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen

cj: Thiram
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen

ck: Thiram 75
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen

cl: Thiram 80
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen

cm: Thiram (ACGIH:OSHA)
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen

cn: Thiramad
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen

co: Thiram B
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen

cp: Thirame
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen

cq: Thirasan
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen

cr: Thiulix
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen

cs: Thiurad
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen

ct: Thiuram
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen

cu: Thiuram D
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen

cv: Thiuram disulfide, tetramethyl-
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen

cw: Thiuramin
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen

cx: Thiuram M
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen

cy: Thiuram M rubber accelerator
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen

cz: Thiuram-G
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen

d: Aceto TETD
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen

da: Thiuram-GO
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen

db: Thiuram-P
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen

dc: Thiuram-PO
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen

dd: Thiuramyl
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen

de: Thylate
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen

df: Tigam
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen

dg: Tirampa
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen

dh: Tiuram
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen

di: Tiuramyl
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen

Diamida de tetrametil-tioperoxidicarbónico
Source: GENERAL QUIMICA, S.A. LANTARON COMUNION (ALAVA)

Disulfuro de bis(dimetiltiocarbamilo)
Source: GENERAL QUIMICA, S.A. LANTARON COMUNION (ALAVA)

Disulfuro de tetrametiltiuram
Source: GENERAL QUIMICA, S.A. LANTARON COMUNION (ALAVA)

dj: TMTD
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen

dk: TMTDS
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen

dl: Trametan
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen

dm: Tridipam
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen

dn: Tripomol
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen

do: Tuads
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen

dp: TUEX
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen

dq: Tulisan
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen

dr: USAF B-30
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen

ds: USAF EK-2089
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen

dt: USAF P-5
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen

du: Vancida TM-95
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen

dv: Vancide TM
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen

dw: VUAgT-I-4
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen

dx: Vulcafor TMTD
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen

dy: Vulkacit MTIC
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen

dz: Vulkacit thiuram
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen

e: Arasan
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen

ea: Vulkacit thiuram/C
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen

eb: Wobezit-Thiuram
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen

ec: ZUPA S 80
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen

f: Arasan 70
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen

g: Arasan 75
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen

h: Arasan-M
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen

i: Arasan 42-S
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen

j: Arasan-SF
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen

k: Arasan-SF-X
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen

l: Aules
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen

m: Bis((dimethylamino)carbonothioyl) disulphide
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen

N,N,N',N'-tetramethylthiuram disulfide
Source: UCB-Chemicals Gent

n: Bis(dimethyl-thiocarbamoyl)-disulfid
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen

Nombre comercial: Rubator DTMT
Source: GENERAL QUIMICA, S.A. LANTARON COMUNION (ALAVA)

o: Bis(dimethylthiocarbamoyl) disulfide
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen

p: Bis(dimethylthiocarbamoyl) disulphide
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen

q: Bis(dimethylthiocarbamyl) disulfide
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen

r: Chipco thiram 75
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen

s: Cyuram DS
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen

t: Disolfuro di tetrametiltiourame
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen

Tetra Methyl Thiuram Disulphide
Source: NORKEM LIMITED KNUTSFORD

tetramethylthiuram bisulfide
Source: UCB-Chemicals Gent

Tetramethylthiuram disulfide; Thioperoxidicarbonic diamide, tetramethyl; Bis(dimethylthiocarbamoyl)disulfide; TMTD
Source: M.L.P.C. RION DES LANDES

tetramethylthiuram disulfide;thiuram disulfide, tetramethyl-, thiuram TMTD
Source: UCB CHEMICALS BRUSSELS

Tetramethylthiuram disulphide
Source: UCB-Chemicals Gent

Tetramethylthiuram disulphide; bis(dimethylthiocarbamoyl)disulfide;
Source: UCB CHEMICALS BRUSSELS

Thioperoxydicarbonic diamide, tetramethyl (CAS-name)
Source: Akzo Nobel Chemicals GmbH Dueren

Thiram
Source: UCB-Chemicals Gent
Akzo Nobel Chemicals GmbH Dueren

thiuram disulfide, tetramethyl-, thiuram TMTD thiuramyl
Source: UCB-Chemicals Gent

thiuramyl; TMT; TMTD; TMTDS; Thiram.
Source: UCB CHEMICALS BRUSSELS

TMT
Source: UCB-Chemicals Gent

TMTD
Source: UCB-Chemicals Gent
GENERAL QUIMICA, S.A. LANTARON COMUNION (ALAVA)
ISAGRO SPA SEGRATE (MI)
Akzo Nobel Chemicals GmbH Dueren

TMTDS
Source: UCB-Chemicals Gent

u: Disulfure de tetramethylthiourame
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen

v: alpha,alpha'-Dithiobis(dimethylthio)formamide
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen

w: N,N'-(Dithiodicarbonothioyl)bis(N-methylmethanamine)
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen

x: Ekagom TB
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen

y: Falitiram
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen

z: Fermide
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen

1.3 Impurities
-

1.4 Additives
-

1.5 Quantity

Quantity 10 000 - 50 000 tonnes

1.6.1 Labelling

Labelling: as in Directive 67/548/EEC
Symbols: Xn
E
Specific limits: no data
R-Phrases: (20/22) Harmful by inhalation and if swallowed
(36/37) Irritating to eyes and respiratory system
(40) Possible risks of irreversible effects
(43) May cause sensitization by skin contact
S-Phrases: (2) Keep out of reach of children
(36/37) Wear suitable protective clothing and gloves

1.6.2 Classification

Classification: as in Directive 67/548/EEC
Class of danger: corrosive
R-Phrases: (20/22) Harmful by inhalation and if swallowed

Classification: as in Directive 67/548/EEC
Class of danger: irritating
R-Phrases: (36/37) Irritating to eyes and respiratory system

Classification: as in Directive 67/548/EEC
Class of danger: mutagenic, category 3
R-Phrases: (40) Possible risks of irreversible effects

Classification: as in Directive 67/548/EEC
Class of danger:
R-Phrases: (43) May cause sensitization by skin contact

1.7 Use Pattern

Type: type
Category: Non dispersive use

Type: type
Category: Use resulting in inclusion into or onto matrix

Type: type
Category: Wide dispersive use

Type: industrial
Category: Agricultural industry

Type: industrial
Category: Personal and domestic use

Type: industrial
Category: Polymers industry

Type: industrial
Category: other: Gummiindustrie

Type: industrial
Category:

Type: industrial
Category: other

Type: use
Category: Non agricultural pesticides

Type: use
Category: Pesticides

Type: use
Category: Vulcanizing agents

Type: use
Category: other: Fungizid

1.7.1 Technology Production/Use
-

1.8 Occupational Exposure Limit Values

Type of limit: MAC (NL)
Limit value: 5 mg/m3
Source: Akzo Nobel Chemicals GmbH Dueren

Type of limit: MAK (DE)
Limit value: 5 mg/m3
Limit value: mg/m3
Source: UCB CHEMICALS BRUSSELS
UCB-Chemicals Gent

Type of limit: MAK (DE)
Limit value: 5 mg/m3
Source: M.L.P.C. RION DES LANDES
(1)

Type of limit: MAK (DE)
Limit value: 5 mg/m3
Remark: Efectos sistémicos :
Pico : 5xMAK (30 minutos), 2 cambios cada 8 horas.
Source: GENERAL QUIMICA, S.A. LANTARON COMUNION (ALAVA)
Test substance: Estado de la sustancia : polvo.
(2)

Type of limit: MAK (DE)
Limit value: 5 mg/m3
Short term expos.
Limit value: 25 mg/m3
Schedule: 30 minute(s)
Frequency: 2 times
Source: Akzo Nobel Chemicals GmbH Dueren

Type of limit: MAK (DE)
Limit value: 5 mg/m3
Remark: Spitzenbegrenzungskategorie 4
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen
(3)

Type of limit: TLV (US)
Limit value: 1 mg/m3
Schedule: hour(s)
Source: UCB CHEMICALS BRUSSELS
UCB-Chemicals Gent

Type of limit: TLV (US)
Limit value: 1 mg/m3
Source: M.L.P.C. RION DES LANDES
(1)

Type of limit: TLV (US)
Limit value: 1 mg/m3
Source: GENERAL QUIMICA, S.A. LANTARON COMUNION (ALAVA)

Type of limit: TLV (US)
Limit value: 1 mg/m3
Source: ISAGRO SPA SEGRATE (MI)

Type of limit: TLV (US)
Limit value: 1 mg/m3
Source: Akzo Nobel Chemicals GmbH Dueren

Type of limit: other
Limit value: 5 mg/m3
Country: France
Remark: Type of Limit: VME
Source: M.L.P.C. RION DES LANDES
(4)

Type of limit: other: (OSHA) TWA
Limit value: 5 mg/m3
Remark: (OSHA) PEL = 5 MG/M3
Source: GENERAL QUIMICA, S.A. LANTARON COMUNION (ALAVA)
(5)

Type of limit: other: OEL/TWA Denmark
Limit value: 2 mg/m3
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen
(6)

Type of limit: other: OEL/TWA MSHA, NIOSH, OSHA, Australia, Austria, Belgium, Finland, France, The Netherlands, Philippines, Switzerland, Thailand, Turkey, United Kingdom
Limit value: 5 mg/m3
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen
(6)

Type of limit: other: OEL/TWA Poland, Russia
Limit value: .5 mg/m3
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen
(6)

1.9 Source of Exposure

Remark: Human : by handling in warehouses or on the field. By application on the field.

Environment : contamination by spray drifts likely.

Production process :
First step : synthesize sodium dimethyldithiocarbamate (SDDC) by reacting carbon disulphide , sodium hydroxide and dimethylamine.

Second step : oxidize SDDC by a mixture of hydrogen peroxide and sulfuric acid to form Thiram.

UCB sites of production : one site in BE.

•

Source: UCB CHEMICALS BRUSSELS

Remark: Human : by handling in warehouses or on the field. By application on the field.

Environment : contamination by spray drifts likely.

Production process :
First step : synthesize sodium dimethyldithiocarbamate (SDDC) by reacting carbon disulphide, sodium hydroxide and dimethylamine.

Second step : oxidize SDDC by a mixture of hydrogen peroxideand sulfuric acid to form Thiram.

UCB sites of production : one site in BE.

Source: UCB-Chemicals Gent

Remark: Batch process.
The powder in suspension is extracted by a centrifugal dryer. The final product is obtained after flash dryer and cyclone.
Effluents containing powder in suspension are purified in a waster tip treatment. Wet wastes are burning in an incinerator.
In the atmospher, dust only appears on the area of the process unit.
If dust on soil, recuperation and incineration.

Source: M.L.P.C. RION DES LANDES

Remark: NON DISPONIBILE

Source: ISAGRO SPA SEGRATE (MI)

Remark: Herstellung:
durch Umsetzung von Dimethylamin (CAS 124-40-3) mit Schwefelkohlenstoff (CAS 75-15-0) und anschließende Oxydation des Natriumdimethyldithiocarbamats (CAS 128-04-1).

Für die Verwendung als Vulkanisationsbeschleuniger wurde dasProdukt als Pulver (Sorten Thiuram P und PO) oder Granulat (Sorten G oder GO) in Verkehr gebracht. Die Sorten PO bzw. GO waren mit ca. 1 % Schmieröl R-15 TGL 11871 nachbehandelt.

Für die Verwendung als Fungizid (Sorte Thiram 80) erfolgte Formulierung mit mineralischen Trägerstoffen sowie Netz- undDispergiermitteln

Source: Chemie GmbH Bitterfeld-Wolfen Wolfen

(7)

1.10.1 Recommendations/Precautionary Measures
-

1.10.2 Emergency Measures
-

1.11 Packaging
-

1.12 Possib. of Rendering Subst. Harmless
-

1.13 Statements Concerning Waste
-

1.14.1 Water Pollution
-

1.14.2 Major Accident Hazards
-

1.14.3 Air Pollution
-

1.15 Additional Remarks

Remark: ELIMINACION : Si es un vertido pequeño recoger con palas y depositar el material en contenedores limpios y secos. Alejar los contenedores del área de vertido. Si es un vertido grande cubrir el vertido con plásticos o lonas para reducir la dispersión, proceder de la misma manera que en el caso anterior. Eliminación de excendentes por disolución en un disolvente inflamable y atomización en una cámara de combustión. Eliminación de resíduos industriales por incineración.
MANIPULACION : Usese protección adecuada (guantes de goma, traje de protección química, gafas de seguridad, protector facial, máscara de protección en ambientes pulverulentos). No fumar, comer ni beber en el área de manipulación. Evitar la exposición a las fuentes de ignición. Sistemas de ventilación local eficientes.
ALMACENAMIENTO : Contenedores correctamente sellados y etiquetados, dispuestos en lugares frescos y ventilados. Mantener alejado de alimientos, bebidas y piensos de animales.
TRANSPORTE :
Nº ONU : 2771

Nº de Identificación del Peligro : 60
ADR(TPC)/RID(TPF) : c. 6.1
Item Nº : 76 c
IATA-DGR : c. 6.1
IMDG : c. 6.1

Source: GENERAL QUIMICA, S.A. LANTARON COMUNION (ALAVA)

Remark: toxikologische Informationen siehe RTECS No. JO1400000
Source: Chemie GmbH Bitterfeld-Wolfen Wolfen

1.16 Last Literature Search
-

1.17 Reviews
-

1.18 Listings e.g. Chemical Inventories
-

2.1 Melting Point

Value: ca. 145 degree C
Decomposition: yes
Method: OECD Guide-line 102 "Melting Point/Melting Range"
Year: 1981
GLP: no
Source: UCB CHEMICALS BRUSSELS
UCB-Chemicals Gent
(8)

Value: 146 degree C
GLP: no
Source: Akzo Nobel Chemicals GmbH Dueren
(9)

Value: = 155 degree C
Decomposition: no
Sublimation: no
Method: other
GLP: no data
Source: GENERAL QUIMICA, S.A. LANTARON COMUNION (ALAVA)

Value: 155.6 degree C
Method: other
GLP: no data
Source: Akzo Nobel Chemicals GmbH Dueren
(10)

2.2 Boiling Point

Value: = 129 degree C at 267 hPa
Decomposition: yes
Method: other
GLP: no data
Remark: 129 grados C a 20mm. de Hg.
Source: GENERAL QUIMICA, S.A. LANTARON COMUNION (ALAVA)
(11)

Value: 129 degree C at 27 hPa
Year: 1988
GLP: no data
Source: Akzo Nobel Chemicals GmbH Dueren
(12)

Value:
Remark: not applicable (decomposition over 150xc)
Source: UCB CHEMICALS BRUSSELS

Value:
Remark: Not applicable (decomposition over 150 C)
Source: UCB-Chemicals Gent

2.3 Density

Type: density
Value: = 1.29 g/cm3 at 20 degree C
Method: other
GLP: no data
Source: GENERAL QUIMICA, S.A. LANTARON COMUNION (ALAVA)

Type: bulk density
Value: 460 - 500 kg/m3 at 20 degree C
Source: Akzo Nobel Chemicals GmbH Dueren

Type: density
Value: = 1425 kg/m3 at 20 degree C
Source: Akzo Nobel Chemicals GmbH Dueren

Type: bulk density
Value: ca. .32 g/cm3 at 20 degree C
GLP: no
Remark: method : CIPAC nt 39
Source: UCB CHEMICALS BRUSSELS
(13)

Type: bulk density
Value: ca. .32 g/cm3 at 20 degree C
GLP: no
Remark: Method : CIPAC nt 39
Source: UCB-Chemicals Gent
(13)

2.3.1 Granulometry
-

2.4 Vapour Pressure

Value: < .00001 hPa at 25 degree C
Year: 1983
GLP: no data
Source: Akzo Nobel Chemicals GmbH Dueren
(14)

Value: > .0000001 hPa at 25 degree C
Method: other (measured)
GLP: no data
Remark: No pertinente
Source: GENERAL QUIMICA, S.A. LANTARON COMUNION (ALAVA)

Value: = .000023 hPa at 25 degree C
Method: OECD Guide-line 104 "Vapour Pressure Curve"
Year: 1981
GLP: no
Source: UCB CHEMICALS BRUSSELS
UCB-Chemicals Gent

(15)

2.5 Partition Coefficient

log Pow: = 1.73 at 20 degree C
Method: OECD Guide-line 107 "Partition Coefficient (n-octanol/water), Flask-shaking Method"
Year: 1981
GLP: no
Source: UCB CHEMICALS BRUSSELS
UCB-Chemicals Gent

(16)

2.6.1 Water Solubility

Value: ca. 16.5 mg/l at 20 degree C
Qualitative: slightly soluble (0.1-100 mg/L)
pKa: -6 at 25 degree C
pH: ca. 7 at 40 g/l and 20 degree C
Year: 1974
GLP: no
Remark: method : ASTM E70-74
••
Source: UCB CHEMICALS BRUSSELS

(17)

Value: ca. 16.5 mg/l at 20 degree C
Qualitative: slightly soluble (0.1-100 mg/L)
pKa: -6 at 25 degree C
pH: ca. 7 at 40 g/l and 20 degree C
Year: 1974
GLP: no
Remark: method : ASTM E70-74
Source: UCB-Chemicals Gent

(18)

Value: 30 mg/l at 20 degree C
Qualitative: of low solubility
Method: other
Year: 1987
GLP: no data
Source: Akzo Nobel Chemicals GmbH Dueren

(19)

Value: = 30 mg/l at 25 degree C
Qualitative: of very low solubility
Method: other: no especificado
Year: 1983
GLP: no data
Source: GENERAL QUIMICA, S.A. LANTARON COMUNION (ALAVA)
(20)

2.6.2 Surface Tension
-

2.7 Flash Point

Value: = 89 degree C
Type: closed cup
Method: other: no especificado
Year: 1981
GLP: no data
Source: GENERAL QUIMICA, S.A. LANTARON COMUNION (ALAVA)
(21)

Value: ca. 150 degree C
Type: other
Method: other
Year:
Remark: Method: Cleveland open cup
Source: Akzo Nobel Chemicals GmbH Dueren

Value:
Type:
Method:
Year:
Remark: non applicable (solid)
Source: UCB CHEMICALS BRUSSELS

Value:
Type:
Method:
Year:
Remark: Non applicable (solid)
Source: UCB-Chemicals Gent

2.8 Auto Flammability

Value:
Remark: not self-flammable
Source: UCB CHEMICALS BRUSSELS

Value:
Remark: Not self-flammable.
Source: UCB-Chemicals Gent

Value:
Remark: La sustancia no se quema por si sola, o se quema con dificultad.
Source: GENERAL QUIMICA, S.A. LANTARON COMUNION (ALAVA)
(22)

2.9 Flammability

Result:
Remark: no specific data
Source: UCB CHEMICALS BRUSSELS

Result:
Remark: No specific data.
Source: UCB-Chemicals Gent

2.10 Explosive Properties

Result:
Remark: Not explosive
Source: UCB CHEMICALS BRUSSELS

Result:
Remark: Not explosive.
Source: UCB-Chemicals Gent

2.11 Oxidizing Properties

Result:
Remark: not an oxidizer (is not reacting with cellulose or saw dust)
Source: UCB CHEMICALS BRUSSELS

Result:
Remark: Not an oxidizer (is not reacting with cellulose or saw dust).
Source: UCB-Chemicals Gent

2.12 Additional Remarks

Remark: ESTABILIDAD : Estable a temperatura ambiente.
CONDICIONES A EVITAR : Humedad, exposición a llamas,chispas.
INCOMPATIBILIDADES : Oxidantes fuertes y ácidos.
PRODUCTOS DE DESCOMPOSICION/COMBUSTION PELIGROSOS: S2C, SOX, NOX, CO2, CO.
MEDIOS DE EXTICION APROPIADOS : Químicos secos, espumas y agua pulverizada.
PELIGROS ESPECIALES : Material combustible. El producto puede arder en contacto con las llamas. Los recipientes pueden explotar violentamente con el calor del fuego.
Source: GENERAL QUIMICA, S.A. LANTARON COMUNION (ALAVA)

Remark: Might react violently with oxidizing agents. Reaction of the substance with nitrosating agents can produce carcinogenic N-nitrosodimethyl amines.
Source: Akzo Nobel Chemicals GmbH Dueren

3.1.1 Photodegradation

Type: air
Light source: Sun light
Spectr.of subst.: lambda (max, >295nm): 242 nm
epsilon (max): 4.1
Conc. of subst.: at 25 degree C
INDIRECT PHOTOLYSIS
Sensitizer: OH
Conc. of sens.: 800000 molecule/cm3
Degradation: = 50 % after 26.6 day
Method: other (calculated)
Year: 1986 GLP: no data
Test substance: as prescribed by 1.1 - 1.4
Source: GENERAL QUIMICA, S.A. LANTARON COMUNION (ALAVA)
(23)

Type: air
Light source: Sun light
Spectr.of subst.: lambda (max, >295nm): 282 nm
epsilon (max): 4
Method:
Year: GLP:
Test substance:
Source: GENERAL QUIMICA, S.A. LANTARON COMUNION (ALAVA)

Type: soil
Light source: Sun light
Method:
Year: GLP:
Test substance:
Remark: La fotolisis del tiram en el suelo puede ser un mecanismo potencial de degradación debido a que absorbe luz solar.
Source: GENERAL QUIMICA, S.A. LANTARON COMUNION (ALAVA)
(24)

Type: soil
Light source: Xenon lamp
Light spect.: 300 - 750 nm
Rel. intensity: 2 based on Intensity of Sunlight
Conc. of subst.: .317 mg/l
DIRECT PHOTOLYSIS
Halflife t1/2: 17.2 day
Method:
Year: 1987 GLP: yes
Test substance: other TS
Source: Akzo Nobel Chemicals GmbH Dueren
Test substance: 97.7% C14-Thiram was used.
(25) (26)

Type: water
Light source: Xenon lamp
Light spect.: 290 nm
Rel. intensity: >=
Spectr.of subst.: lambda (max, >295nm): .4 nm
epsilon (max): 7279
Conc. of subst.: 10 mg/l
DIRECT PHOTOLYSIS
Halflife t1/2: ca. 4.1 hour(s)
Degradation: ca. 2 % after 24 hour(s)
Quantum yield: 2.97
Method:
Year: 1990 GLP: yes
Test substance: other TS: 14 C-Thiram
Remark: Method : "Richtlinien f r die Pr fung von Pflanzenschutzmitteln im Zulassungsverfahren Teil IV,6-1; Biologische Bundesanstalt (BBA), D-38104 Braunschweig (1990)
Testing at ph7 (buffered system)
Source: UCB CHEMICALS BRUSSELS
(27)

Type: water
Light source: Xenon lamp
Light spect.: 290 nm
Rel. intensity: >=
Spectr.of subst.: lambda (max, >295nm): .4 nm
epsilon (max): 7279
Conc. of subst.: 10 mg/l at 20 degree C
DIRECT PHOTOLYSIS
Halflife t1/2: ca. 4.1 hour(s)
Degradation: ca. 2 % after 24 hour(s)
Quantum yield: 2.97
Method:
Year: 1990 GLP: yes
Test substance: other TS: 14 C-Thiram
Remark: Method : "Richtlinien fur die Prufung von Pflanzenschutzmitteln im Zulassungsverfahren Teil IV,6-1; Biologische Bundesanstalt (BBA), D-38104 Braunschweig (1990).
Testing at ph7 (buffered system)
Source: UCB-Chemicals Gent
(27)

Type:
Method:
Year: GLP:
Test substance:
Remark: El tiram en metanol absorbe luz UV a la longitud de onda >290nm. Este dato sugiere que el tiram en disolución acuosa puede ser suceptible a la fotolisis.
Source: GENERAL QUIMICA, S.A. LANTARON COMUNION (ALAVA)
(28)

3.1.2 Stability in Water

Type: abiotic
t1/2 pH7: 2 day at 25 degree C
t1/2 pH9: 4 - 7 hour(s) at 25 degree C
t1/2 pH 5 : 77 day at 25 degree C
at pH 8 and 25 degree C
Method: other
Year: 1987 GLP: yes
Test substance: other TS
Source: Akzo Nobel Chemicals GmbH Dueren
Test substance: 97.4% test substance was used

(29)

Type: biotic
t1/2 pH 7.8 : 46 hour(s) at 20 degree C
Degradation: 90 % after 153 hour(s)
at pH 7.8 and 20 degree C
Method: other: BBA Teil IV : 5-1 (1990)
Year: 1990 GLP: yes
Test substance: other TS: 14c- Thiram, 99.7 % radiochemical purity
Source: UCB CHEMICALS BRUSSELS
Test substance: conc. of substance : 1.1 mg/l (nominal)

Degradation products (water phase) - carbon disulphide (CAS75-15-0) :
max 0.073 % at day 4; nil at day 14.

dimethyldithiocarbamic acid, methyl ester :
0.076 % max at day 4, nil at day 57.

(30)

Type: biotic
t1/2 pH 7.8 : 46 hour(s) at 20 degree C
Degradation: 90 % after 153 hour(s)
at pH 7.8 and 20 degree C
Method: other: BBA Teil IV : 5-1 (1990)
Year: 1990 GLP: yes
Test substance: other TS: 14c-Thiram, 99,7% radiochemical purity
Source: UCB-Chemicals Gent
Test substance: Conc. of substnace : 1.1 mg/l (nominal)

Degradation products (water phase) - carbon disulphide (CAS75-15-0) :
max 0.073% at day 4; nil at day 14.

Dimethyldithiocarbamic acid, methyl ester :
0.076% max at day 4; nil at day 57.

(30)

Type:
Method: other: sin especificar
Year: 1973 GLP: no data
Test substance: as prescribed by 1.1 - 1.4
Remark: La sustancia vertida en el agua puede descomponerse químicamente en condiciones ácidas , posiblemente a dimetilditiocarbamato.
Source: GENERAL QUIMICA, S.A. LANTARON COMUNION (ALAVA)

(31)

3.1.3 Stability in Soil

Type: laboratory Radiolabel: yes
Concentration: 20.367 mg/kg
Soil humidity: 14.4 g water/100g soil dry weight
Soil classif.: USDA Year:
Content of clay: 14.8 %
silt: 29.6 %
sand: 55.6 %
Organ. carbon: 2.4 %
pH: 6.7
Cation exch. capac. 14.4 meq/100 g soil dry weight
Microbial biomass: 39.1 mg biomass/100 g soil dry weight
Dissipation time
DT50: ca. .5 day
DT90: ca. 6 day
Dissipation: 100 % after 128 day
Method: other: EPA/FIFRA u 162-1
Year: 1982 GLP: yes
Test substance: other TS: C-Thiram 98.4 % radiochemical purity
Source: UCB CHEMICALS BRUSSELS

(32)

Type: laboratory Radiolabel: yes
Concentration: 20.367 mg/kg
Soil temp.: 20 degree C
Soil humidity: 14.4 g water/100g soil dry weight
Soil classif.: USDA Year:
Content of clay: 14.8 %
silt: 29.6 %
sand: 55.6 %
Organ. carbon: 2.4 %
pH: 6.7
Cation exch. capac. 14.4 meq/100 g soil dry weight
Microbial biomass: 39.1 mg biomass/100 g soil dry weight
Dissipation time
DT50: ca. .5 day
DT90: ca. 6 day
Dissipation: 100 % after 128 day
Method: other: EPA/FIFRA par. 162-1

Year: 1982 GLP: yes
Test substance: other TS: C-Thiram 98.4% radiochemical purity
Source: UCB-Chemicals Gent

(32)

Type: laboratory Radiolabel: no
Concentration: 76 mg/kg
Soil temp.: 22 degree C
Content of clay: 38 %
silt: 10 %
sand: 52 %
Organ. carbon: .5 %
pH: 5
Cation exch. capac. 3 meq/100 g soil dry weight
Microbial biomass:
Method: other
Year: 1988 GLP: yes
Test substance: other TS
Remark: Halflife 42.7 days. The test substance has a short half-life and no apparent leaching potential.
Source: Akzo Nobel Chemicals GmbH Dueren
Test substance: 77.3% A.I. material was used

(33)

Type: Radiolabel:
Concentration:
Cation exch. capac.
Microbial biomass:
Method: other: sin espcificar
Year: 1984 GLP: no data
Test substance: as prescribed by 1.1 - 1.4
Remark: Liberado en el suelo se degrada por descomposición bajo condiciones ácidas, posiblemente a dimetilditiocarbamato, y por degradación bacteriana.
Source: GENERAL QUIMICA, S.A. LANTARON COMUNION (ALAVA)

(34)

Type: Radiolabel:
Concentration:
Cation exch.
capac.
Microbial
biomass:
Method:
Year: GLP:
Test substance:
Remark: La persistencia de la sustancia en suelo depende de distintas variables como pH, tipo de suelo (contenido en humus) y concentración. 180 ppm de tiram distribuidos en el suelo tienen una vida media de 1 a 2 días; pero cuando se añaden a un sustrato inactivo (vidrio) después de 21 días sólo % se degrada el 10 %.
Source: GENERAL QUIMICA, S.A. LANTARON COMUNION (ALAVA)
(24)

Type: Radiolabel:
Concentration:
Cation exch.
capac.
Microbial
biomass:
Method:
Year: GLP:
Test substance:
Remark: El tiram vertido al suelo en una concentración de 100 y 1000 ppm persiste durante 4 o más de 32 semanas, respectivamente.
Source: GENERAL QUIMICA, S.A. LANTARON COMUNION (ALAVA)
(34)

Type: Radiolabel:
Concentration:
Cation exch.
capac.
Microbial
biomass:
Method:
Year: GLP:
Test substance:
Remark: Se ha observado que el tiram se descompone más lentamente en los suelos con un contenido en humus =< 1.2 %.
Source: GENERAL QUIMICA, S.A. LANTARON COMUNION (ALAVA)
(35)

Type: Radiolabel:
Concentration:
Cation exch. capac.
Microbial biomass:
Method:
Year: GLP:
Test substance:
Remark: El tiram persiste unos dos meses en suelo tipo arenoso, pero desaparece en una semana en un suelo tipo compost. Se ha comprobado también que el tiram es más persistente en suelo tipo arenoso que en suelo tipo aluvial.
Source: GENERAL QUIMICA, S.A. LANTARON COMUNION (ALAVA)
(34)

Type: Radiolabel:
Concentration:
Cation exch. capac.
Microbial biomass:
Method:
Year: GLP:
Test substance:
Remark: En suelos tipo arena-humus con pH 3.5, el tiram se descompuso casi completamente a las 4-5 semanas, mientras que en suelos con pH 7.0, el tiram se descompuso a las 14-15 semanas.
Source: GENERAL QUIMICA, S.A. LANTARON COMUNION (ALAVA)
(36)

3.2 Monitoring Data (Environment)

Type of measurement:
Medium:
Method:
Concentration
Source: Akzo Nobel Chemicals GmbH Dueren

3.3.1 Transport between Environmental Compartments

Type: adsorption
Media: water - soil
Air (Level I):
Water (Level I):
Soil (Level I):
Biota (L.II/III):
Soil (L.II/III):
Method: other: sin especificar
Year: 1984
Remark: Coeficiente de adsorción (koc) : 672. Podría adsorberse fuertemente en el suelo.
Es relativamente inmóvil en arena margosa, turba y arcilla negra.
Source: GENERAL QUIMICA, S.A. LANTARON COMUNION (ALAVA)
(37)

Type: volatility
Media: water - soil
Air (Level I):
Water (Level I):
Soil (Level I):
Biota (L.II/III):
Soil (L.II/III):
Method: other: sin especificar
Year: 1983
Remark: Constante de la Ley de Henry : <7.9E-8 atm.m3/mol. No se volatiliza sobre superficies secas o húmedas ni desde el agua.
Source: GENERAL QUIMICA, S.A. LANTARON COMUNION (ALAVA)
(38)

Type: other
Media: water - soil
Air (Level I):
Water (Level I):
Soil (Level I):
Biota (L.II/III):
Soil (L.II/III):
Method: other
Year: 1986
Remark: Concentrations used: 0.1, 0.5, 1.0 and 10 ppm

Soil type	Adsorp. Coeff.	Desorp.
Sand	3.74	75.9
Sandy loam	13.6	5.4
Clay loam	36.6	235
Florida muck	78.3	196

Adsorp. Desorp.

Soil type		Constant
Sand	4300	87240
Sandy loam	951	3590
Clay loam	1620	10400
Florida muck	261	653

The chemical has slight mobility trough sand and low mobility through sandy loam, clay loam and Florida muck. Percent desorbed is low in all test systems; material is readily incorporated in soil matrix.

Source: Akzo Nobel Chemicals GmbH Dueren
Test substance: 98.9% A.I. C14-Thiram was used

(39)

3.3.2 Distribution

-

3.4 Mode of Degradation in Actual Use

Remark: Suelo: Descomposición química, biodegradación, absorción y fotolisis.
Agua: Descomposición química, absorción y fotolisis.
Aire: Fotolisis indirecta.
Source: GENERAL QUIMICA, S.A. LANTARON COMUNION (ALAVA)

Source: Akzo Nobel Chemicals GmbH Dueren

3.5 Biodegradation

Type: aerobic
Inoculum: predominantly domestic sewage, non-adapted
Concentration: 2 mg/l related to Test substance
Degradation: = 100 % after 28 day
Result: readily biodegradable
Method: OECD Guide-line 301 D "Ready Biodegradability: Closed Bottle Test"
Year: 1992 GLP:
Test substance: as prescribed by 1.1 - 1.4
Remark: Because of the high oxygen consumption the percentage biodegradation was calculated for three different ThOD-values with breakdown of N to NH3 or HNO3, and S to H2S or H2SO4.

The results form the biodegradation test are then as follows:
ThOD (NH3, H2S) : 174 % degradation in 28 days
ThOD (HNO3, H2S) : 101 % degradation in 28 days
ThOD (HNO3, H2SO4): 54 % degradation in 28 days

After 28 days, the Closed Bottle Test was continued for two

additional weeks (day 42) and no further increase in degradation was found.
Therefore it is concluded that the substance is completely mineralized in 28 days.
Source: Akzo Nobel Chemicals GmbH Dueren

(40)

Type: aerobic
Inoculum: predominantly domestic sewage, non-adapted
Concentration: 100 mg/l related to Test substance
Degradation: 0 % after 28 day
Result: under test conditions no biodegradation observed
Method: other: MITI test nach Dr. Painter
Year: GLP: no data
Test substance: as prescribed by 1.1 - 1.4
Remark: A relatively high concentration of test substance was used, which may have caused initial toxicity to the test system.
Source: Akzo Nobel Chemicals GmbH Dueren

(41)

Type: aerobic
Inoculum: other
Concentration: 300 related to Test substance
Degradation: = 20 % after 24 day
Result: inherently biodegradable
Method: other: sin especificar
Year: 1985 GLP: no data
Test substance: no data
Remark: Se degradó el 25% en el ensayo realizado sin autoclave.
Source: GENERAL QUIMICA, S.A. LANTARON COMUNION (ALAVA)
Test condition: Marga arenosa aluvial (pH 7.3) Con y sin autoclave.
Test substance: La concentracción es de 300 ppm.

(42)

Type: aerobic
Inoculum: Pseudomonas aeruginosa (Bacteria)
Concentration: 300 related to Test substance
Degradation: = 90 % after 24 day
Testsubstance: 8 day 50 %
Method:
Year: GLP:
Test substance:
Source: GENERAL QUIMICA, S.A. LANTARON COMUNION (ALAVA)
Test condition: Inóculo: Marga arenosa aluvial inoculada con Pseudomonas aeruginosa. Con y sin autoclave.
Test substance: La concentracción es de 300 ppm.

(43)

Type:
Inoculum: activated sludge
Concentration: 100 related to Test substance
Degradation: < 30 % after 15 day
Method:
Year: GLP:
Test substance:
Source: GENERAL QUIMICA, S.A. LANTARON COMUNION (ALAVA)
Test substance: La concentracción es de 100 ppm.

(44)

3.6 BOD5, COD or BOD5/COD Ratio

-

3.7 Bioaccumulation

Species:
Exposure period: at 25 degree C
Concentration:
BCF: 91
Elimination: no
Method: other: sin especificar
Year: 1983 GLP: no data
Test substance: no data
Remark: El valor del FBC sugiere que el tiram no se bioconcentra en los organismos acuáticos.
Source: GENERAL QUIMICA, S.A. LANTARON COMUNION (ALAVA)

(45)

3.8 Additional Remarks

-

AQUATIC ORGANISMS

4.1 Acute/Prolonged Toxicity to Fish

Type: other: sin especificar
Species: Cyprinus carpio (Fish, fresh water)
Exposure period:
Unit: mg/l Analytical monitoring: no data
LC50: = 4
Method: other: sin especificar
Year: 1987 GLP: no data
Test substance: no data
Source: GENERAL QUIMICA, S.A. LANTARON COMUNION (ALAVA)
(46)

Type: other: sin especificar
Species: Ictalurus punctatus (Fish, fresh water)
Exposure period: 24 hour(s)
Unit: Analytical monitoring: no data
TLM : > 1
Method: other: sin especificar
Year: 1994 GLP: no data
Test substance: no data
Remark: Unidad: ppm
Source: GENERAL QUIMICA, S.A. LANTARON COMUNION (ALAVA)
Test condition: Medio del ensayo: Agua corriente.
(47)

Type: other: sin especificar
Species: Lepomis macrochirus (Fish, fresh water)
Exposure period:
Unit: mg/l Analytical monitoring: no data
LC50: = .23
Method: other: no especificado
Year: 1987 GLP: no data
Test substance: no data
Source: GENERAL QUIMICA, S.A. LANTARON COMUNION (ALAVA)
(48)

Type: semistatic
Species: Brachydanio rerio (Fish, fresh water)
Exposure period: 9 day
Unit: µg/l Analytical monitoring: no
Method: OECD Guide-line 204 "Fish, Prolonged Toxicity Test: 14-day Study"
Year: 1984 GLP: no
Test substance: other TS
Remark: Renewal of test media after 48 hours.
Results: NOEC survival : 1 uG/L
NOEC hatching : 0.32 uG/L
NOEC malformations : 3.2 uG/L
Source: Akzo Nobel Chemicals GmbH Dueren
Test substance: 97.9 % A.I. Test material
(49)

Type: semistatic
Species: Poecilia reticulata (Fish, fresh water)
Exposure period: 96 hour(s)
Unit: mg/l Analytical monitoring: no data
LC50: .27
Method: OECD Guide-line 203 "Fish, Acute Toxicity Test"
Year: 1986 GLP: no
Test substance: other TS
Remark: Test media were renewed every 24 hours.
Source: Akzo Nobel Chemicals GmbH Dueren
Test substance: Purity >= 98 %

(50)

Type: semistatic
Species: Poecilia reticulata (Fish, fresh water)
Exposure period: 96 hour(s)
Unit: µg/l Analytical monitoring: no
LC50: 6
LC100: 10
Method: OECD Guide-line 203 "Fish, Acute Toxicity Test"
Year: 1984 GLP: no
Test substance: other TS
Remark: Renewal of test media after 48 hours
Source: Akzo Nobel Chemicals GmbH Dueren
Test substance: 97.9 % A.I. test material was used

(51)

Type: semistatic
Species: Poecilia reticulata (Fish, fresh water)
Exposure period: 96 hour(s)
Unit: µg/l Analytical monitoring: no
LC0: 3.2
LC50: 8.85
LC100: 32
Method: OECD Guide-line 203 "Fish, Acute Toxicity Test"
Year: 1984 GLP: no
Test substance: other TS
Remark: Renewal of test media after 48 hours
Source: Akzo Nobel Chemicals GmbH Dueren
Test substance: 97.9 % A.I. test material was used

(52)

Type: semistatic
Species: Poecilia reticulata (Fish, fresh water)
Exposure period: 96
Unit: µg/l Analytical monitoring: no
LC0: 5.6
LC50: 11.1
LC100: 18
Method: OECD Guide-line 203 "Fish, Acute Toxicity Test"
Year: 1987 GLP: no
Test substance: other TS
Remark: Renewal of media after 48 hours
Source: Akzo Nobel Chemicals GmbH Dueren
Test substance: 97.9 % A.I. test material

(53)

Type: semistatic
Species: Salmo gairdneri (Fish, estuary, fresh water)
Exposure period: 60 day
Unit: µg/l Analytical monitoring: no
LC50: 1.1
EC50 : .65
Method: other
Year: 1986 GLP: no
Test substance: other TS
Remark: A further series of studies were conducted which describes the aquatic toxicity and embryolarval of dithiocarbamates in rainbow trout.
References:
van Leeuwen, C.J. (1986) Dithiocarbamates, a hazard to aquatic ecosystem functioning. Environ, Contam., Int. Conf., 2nd: 215-217.
van Leeuwen, C.J. et al. (1986). Aquatic toxicological aspects of dithiocarbamates and related compounds:III. Embryolarval studies with rainbow trout (Salmo gairdneri). Aquat. Toxicol. (AMST), 9, 129-146.
van Leeuwen, C.J. et al. (1986). Aquatic toxicological aspects of dithiocarbamates and related compounds: IV. teratogenicity and histopathology in rainbow trout (Salmo gairdneri) Aquat. Toxicol. (AMST), 9, 147-160.
van Leeuwen, C.J. et al. (1986). Sublethal effects of tetramethylthiuramdisulfide (Thiram) in rainbow trout (Salmo gairdneri). Aquat. Toxicol. (AMST), 9, 13-20.
Source: Akzo Nobel Chemicals GmbH Dueren
Test substance: 98 % A.I. material

(54)

Type: static
Species: Leuciscus idus (Fish, fresh water)
Exposure period: 96 hour(s)
Unit: mg/l Analytical monitoring: no
LC50: 1.2
Method:
Year: GLP:
Test substance: as prescribed by 1.1 - 1.4
Source: Akzo Nobel Chemicals GmbH Dueren

(55)

Type: static
Species: Leuciscus idus melanotus (Fish, fresh water)
Exposure period: 96 hour(s)
Unit: mg/l Analytical monitoring: yes
LC0: ca. .77
LC50: ca. 1.2
Method: other: not stated
Year: GLP: no
Test substance: other TS: Thiram technical (96.7 % purity)
Source: UCB CHEMICALS BRUSSELS

(56)

Type: static
Species: Leuciscus idus melanotus (Fish, fresh water)
Exposure period: 96 hour(s)
Unit: mg/l Analytical monitoring: yes
LC0: ca. .77
LC50: ca. 1.2
Method: other: not stated
Year: GLP: no
Test substance: other TS: Thiram technical (96.7% purity)
Source: UCB-Chemicals Gent

(56)

Type: static
Species: Salmo gairdneri (Fish, estuary, fresh water)
Exposure period: 96 hour(s)
Unit: mg/l Analytical monitoring: no
LC50: ca. .16
Method:
Year: GLP: no
Test substance:
Remark: method : not stated
Source: UCB CHEMICALS BRUSSELS
Test substance: Thiram technical (96.7 % purity)

(57)

Type: static
Species: Salmo gairdneri (Fish, estuary, fresh water)
Exposure period: 96 hour(s)
Unit: mg/l Analytical monitoring: no
LC50: ca. .16
Method:
Year: GLP: no
Test substance:
Remark: Method : not stated.
Source: UCB-Chemicals Gent
Test substance: Thiram technical (96.7% purity)

(57)

Type: static
Species: Salmo gairdneri (Fish, estuary, fresh water)
Exposure period: 96 hour(s)
Unit: mg/l Analytical monitoring: no
LC50: .16
Method:
Year: GLP:
Test substance: as prescribed by 1.1 - 1.4
Source: Akzo Nobel Chemicals GmbH Dueren

(58)

Type:
Species: Lepomis macrochirus (Fish, fresh water)
Exposure period: 96 hour(s)
Unit: mg/l Analytical monitoring:
LC50: .13
Method:
Year: GLP: yes
Test substance: as prescribed by 1.1 - 1.4
Source: Akzo Nobel Chemicals GmbH Dueren

(59)

Type:
Species: Oncorhynchus mykiss (Fish, fresh water)
Exposure period: 96 hour(s)
Unit: mg/l Analytical monitoring:
LC50: .13
Method:
Year: GLP: yes
Test substance: as prescribed by 1.1 - 1.4
Source: Akzo Nobel Chemicals GmbH Dueren

(60)

Type:
Species: Pimephales promelas (Fish, fresh water)
Exposure period: 96 hour(s)
Unit: mg/l Analytical monitoring:
LC50: .27
Method:
Year: GLP: yes
Test substance: as prescribed by 1.1 - 1.4
Source: Akzo Nobel Chemicals GmbH Dueren

(61)

4.2 Acute Toxicity to Aquatic Invertebrates

Type:
Species: Asellus sp. (Crustacea)
Exposure period: 24 hour(s)
Unit: mg/l Analytical monitoring: no data
EC50: = 1882
Method: other: no especificado
Year: 1983 GLP: no data
Test substance: other TS
Source: GENERAL QUIMICA, S.A. LANTARON COMUNION (ALAVA)
Test condition: ESPECIE : ASELLUS AQUATICUS
Test substance: Concentración : ppm

(62)

Type:
Species: Daphnia magna (Crustacea)
Exposure period: 48 hour(s)
Unit: mg/l Analytical monitoring: no
EC50: .21
Method: OECD Guide-line 202, part 1 "Daphnia sp., Acute Immobilisation Test"
Year: 1986 GLP: no
Test substance: other TS
Source: Akzo Nobel Chemicals GmbH Dueren
Test substance: 98 % A.I. test material

(54)

Type:
Species: Daphnia magna (Crustacea)
Exposure period: 48 hour(s)
Unit: µg/l Analytical monitoring: no data
CL50 : = 210
Method: other: sin especificar
Year: 1994 GLP: no data
Test substance: no data
Source: GENERAL QUIMICA, S.A. LANTARON COMUNION (ALAVA)

(63)

Type:
Species: Gammarus pulex (Crustacea)
Exposure period: 24 hour(s)
Unit: mg/l Analytical monitoring: no data
EC50: = 14
Method: other: calculado
Year: 1982 GLP: no data
Test substance: other TS
Remark: LC50 : 0.195ppm/96 hr
Source: GENERAL QUIMICA, S.A. LANTARON COMUNION (ALAVA)
Test condition: Unidad: ppm.
Test substance: Tiram 80%

(64)

Type:
Species: Gammarus pulex (Crustacea)
Exposure period:
Unit: Analytical monitoring:
Method:
Year: GLP:
Test substance:
Remark: LC50 calculated for two commercial products (thiram 80%) were in the range of:
- 14 mg/l (24 h) to 0.195 mg/l (96 h) for product A
- 4.77 mg/l (24 h) to 0.13 mg/l (96 h) for product B, in aqueous suspensions
Product A: 80% Thiram, Pomarsol (Bayer)
Product B: 80% Thiram, KB cloque du pecher (Rhodic).
Source: Akzo Nobel Chemicals GmbH Dueren

(65)

4.3 Toxicity to Aquatic Plants e.g. Algae

Species: Chlorella pyrenoidosa (Algae)
Endpoint: growth rate
Exposure period: 96 hour(s)
Unit: mg/l Analytical monitoring: no
EC50: 1
Method: OECD Guide-line 201 "Algae, Growth Inhibition Test"
Year: GLP: no data
Test substance: as prescribed by 1.1 - 1.4
Source: Akzo Nobel Chemicals GmbH Dueren

(54)

Species: Chlorella pyrenoidosa (Algae)
Endpoint: other: sin especificar
Exposure period: 96 hour(s)
Unit: mg/l Analytical monitoring:
EC50: = 1
Method: other: sin especificar
Year: GLP: no data
Test substance: no data
Source: GENERAL QUIMICA, S.A. LANTARON COMUNION (ALAVA)

(63)

Species: Scenedesmus acutus (Algae)
Endpoint: growth rate
Exposure period:
Unit: mg/l Analytical monitoring:
Method:
Year: GLP:
Test substance:
Remark: After 5 days there is a decrease of 57.2% in growth at 0.5 mg/l thiram.
After 72 hour Thiram was lethal to the algae at 10 mg/l. The decrease of growth was 16.9% for 500 ppb Thiram.
Source: Akzo Nobel Chemicals GmbH Dueren
Test condition: The growth rate of the algae was monitored by optical density (OD) measurements, microscopic examination and visible observations regarding the color of the culture and sedimentation effect.
The test was conducted at 28 deg. C.
Ethylalcohol was used as co-solvent.

(66)

Species: Scenedesmus subspicatus (Algae)
Endpoint: growth rate
Exposure period: 96 hour(s)
Unit: mg/l Analytical monitoring: no
EC50: < .1
Method:
Year: GLP:
Test substance: as prescribed by 1.1 - 1.4
Source: Akzo Nobel Chemicals GmbH Dueren

(67)

Species: Selenastrum capricornutum (Algae)
Endpoint: growth rate
Exposure period: 120 hour(s)
Unit: mg/l Analytical monitoring: yes
NOEC: ca. .0057
EC50: .076
Method:
Year: 1982 GLP: yes
Test substance:
Remark: Method : EPA/FIFRA u 122-2/123-2
Source: UCB CHEMICALS BRUSSELS
Test substance: Thiram technical (99 % purity)

(68)

Species: Selenastrum capricornutum (Algae)
Endpoint: growth rate
Exposure period: 120 hour(s)
Unit: mg/l Analytical monitoring: yes
NOEC: ca. .0057
EC50: .076
Method:
Year: 1982 GLP: yes
Test substance:
Remark: Method : EPA/FIFRA par. 122-2/123-2
Source: UCB-Chemicals Gent
Test substance: Thiram technical (99% purity)

(68)

4.4 Toxicity to Microorganisms e.g. Bacteria

Type: aquatic
Species: Pseudomonas putida (Bacteria)
Exposure period:
Unit: mg/l Analytical monitoring: yes
EC0: > 200
EC10: > 200
Method: other
Year: 1991 GLP: no
Test substance: as prescribed by 1.1 - 1.4
Source: Akzo Nobel Chemicals GmbH Dueren
Test condition: Robra-test. EC50 is the concentration at which a 50% reduction in oxygen consumption is measured.
The highest practical concentration was used. Due to the low solubility a higher concentration was not possible.

(69)

4.5 Chronic Toxicity to Aquatic Organisms

4.5.1 Chronic Toxicity to Fish

Species:	Salmo gairdneri (Fish, estuary, fresh water)		
Endpoint:	other		
Exposure period:	21 day		
Unit:	mg/l	Analytical monitoring:	no
NOEC:	.0032		
LC50 :	< .0081		
Method:	other: OECD Guide-line 204		
Year:	1984	GLP:	yes
Test substance:			
Source:	UCB CHEMICALS BRUSSELS		
Test substance:	Thiram technical (99.7 % purity)		

(70)

Species:	Salmo gairdneri (Fish, estuary, fresh water)		
Endpoint:	other		
Exposure period:	21 day		
Unit:	mg/l	Analytical monitoring:	no
NOEC:	.0032		
LC50 :	< .0081		
Method:	other: OECD Guide-line 204		
Year:	1984	GLP:	yes
Test substance:			
Source:	UCB-Chemicals Gent		
Test substance:	Thiram technical (99.7% purity)		

(70)

4.5.2 Chronic Toxicity to Aquatic Invertebrates

Species:	Daphnia magna (Crustacea)		
Endpoint:	mortality		
Exposure period:	21 day		
Unit:	µg/l	Analytical monitoring:	no
EC50:	8		
Method:	other		
Year:	1986	GLP:	no
Test substance:	other TS		
Source:	Akzo Nobel Chemicals GmbH Dueren		
Test substance:	98 % A.I. test material		

(54)

Species: other: ver observación
Endpoint: other: sensibilización
Exposure period:
Unit: Analytical monitoring: no data
Method: other: no especificado
Year: 1983 GLP: no data
Test substance: other TS
Remark: Se realizaron experimentos de toxicidad aguda (24,48,72 y 96 horas) con seis especies de invertebrados acuáticos (larvas). Se clasificaron en orden creciente de acuerdo al grado de sensibilización mostrado tal como se recoge a continuación: asellus, limnaea, gammarus y cloeon para el nivel 1, dugesia y xenopus. El espectro de la actividad del tiram resultó estar entre 10 ppb y 5000 a 6000 ppm. Por lo que se deduce que el tiram es peligroso para la fauna de agua dulce.
Source: GENERAL QUIMICA, S.A. LANTARON COMUNION (ALAVA)
Test substance: Soluciones acuosas de Tiram.

(71)

TERRESTRIAL ORGANISMS

4.6.1 Toxicity to Soil Dwelling Organisms

Type: artificial soil
Species: Eisenia fetida (Worm (Annelida), soil dwelling)
Endpoint: mortality
Exposure period: 14 day
Unit: mg/kg soil dw
NOEC: 225
LC0: 112.5
LC50: 540
LC100: 1800
Method: OECD Guide-line 207 "Earthworm, Acute Toxcity Test"
Year: 1984 GLP: yes
Test substance:
Source: UCB CHEMICALS BRUSSELS
Test substance: Thiram technical (99 % purity)

(72)

Type: artificial soil
Species: Eisenia fetida (Worm (Annelida), soil dwelling)
Endpoint: mortality
Exposure period: 14 day
Unit: mg/kg soil dw
NOEC: 225
LC0: 112.5
LC50: 540
LC100: 1800
Method: OECD Guide-line 207 "Earthworm, Acute Toxcity Test"
Year: 1984 GLP: yes
Test substance:
Source: UCB-Chemicals Gent
Test substance: Thiram technical (99% purity)

(72)

4.6.2 Toxicity to Terrestrial Plants

-

4.6.3 Toxicity to other Non-Mamm. Terrestrial Species

-

4.7 Biological Effects Monitoring

Remark: Because of the major instabilities shown for Thiram in water, soil, and the environment at large, any retarded or accumulative effect is unlikely to occur in relevant host organisms.
Source: UCB CHEMICALS BRUSSELS

Remark: Because of the major instabilities shown for Thiram in water, soil and the environment at large, any retarded or accumulative effect is unlikely to occur in relevant host organisms.
Source: UCB-Chemicals Gent

4.8 Biotransformation and Kinetics

Type: plant
Method: 14C-Thiram was applied one time on apples at the 2 cm diameter development stage (rate : 29.5 kg a.i. /ha) Fruits were collected at day 0, 14, 28, 56 and 101 (harvest) after application.

Residues in the fruits were evaluated after washing.

Findings :

- No Thiram (parent) residue was detected in treated fruits except on day 0 as traces.

- Some radioactivity was penetrating the treated fruits. However, it has been established that most of the residues were present as natural products (so, they entered the carbon pool). A portion of the radioactivity (5-7 %) in apples was also associated with CS2 to form the so-called"CS2 generators".

Source: UCB CHEMICALS BRUSSELS

(73)

Type:
Method: 14C-Thiram was applied one time on apples at the 2 cm diameter development stage (rate : 29.5 kg a.i./ha). Fruits were collected at day 0, 14, 28, 56 and 101 (harvest)after application.

Residues in the fruits were evaluated after washing.

Findings :
- No Thiram (parent) residue was detected in treated fruits except on day 0 as traces.

- Some radioactivity was penetrating the treated fruits. However, it has been established that most of the residues were present as natural products (so, they entered the carbon pool). A portion of the radioactivity (5-7%) in apples was also associated with CS2 to form the so-called "CS2 generations".

Source: UCB-Chemicals Gent

(74)

4.9 Additional Remarks

Source: UCB CHEMICALS BRUSSELS

5.1 Acute Toxicity

5.1.1 Acute Oral Toxicity

Type:	LD50
Species:	rat
Strain:	
Sex:	
Number of Animals:	
Vehicle:	
Value:	ca. 1800 mg/kg bw
Method:	other: EPA/FIFRA u 81-1
Year:	1982 GLP: yes
Test substance:	other TS: Thiram grade 99-100 %
Remark:	Clinical signs: body weight loss, apathy, reduced locomotive activity, laboured breathing, ungroomed appearance, reduced fecal excretion, (half) closed and moist eyes, tremors of the head.
Source:	UCB CHEMICALS BRUSSELS

(75)

Type:	LD50
Species:	rat
Strain:	
Sex:	
Number of Animals:	
Vehicle:	
Value:	ca. 1800 mg/kg bw
Method:	other: EPA/FIFRA par. 81-1
Year:	1982 GLP: yes
Test substance:	other TS: Thiram grade 99-100%
Remark:	Clinical signs : body weight loss, apathy, reduced locomotive activity, laboured breathing, ungroomed appearance, reduced fecal excretion, (half) closed and moisteyes, tremors of the head.
Source:	UCB-Chemicals Gent

(75)

Type:	LD50
Species:	rat
Strain:	
Sex:	
Number of Animals:	
Vehicle:	
Value:	= 560 mg/kg bw
Method:	other: sin especificar
Year:	1967 GLP: no data
Test substance:	no data
Source:	GENERAL QUIMICA, S.A. LANTARON COMUNION (ALAVA)

(76)

Type: LD50
Species: rat
Strain:
Sex:
Number of Animals:
Vehicle:
Value: 2600 mg/kg bw
Method: other
Year: 1985 GLP: yes
Test substance: as prescribed by 1.1 - 1.4
Remark: BG Chemie, Toxicological Evaluations 3 reports several acute oral LD50 values (rat) in the range of 800-4000 mg/kg. The composition of the tested material however is not given. Study was carried out in conformity with EPA Guideline 81-1.
Source: Akzo Nobel Chemicals GmbH Dueren

(77)

Type: LD50
Species: rat
Strain:
Sex:
Number of Animals:
Vehicle:
Value: 1080 mg/kg bw
Method: other
Year: GLP: yes
Test substance: as prescribed by 1.1 - 1.4
Source: Akzo Nobel Chemicals GmbH Dueren

(78)

Type: LD50
Species: rat
Strain:
Sex:
Number of Animals:
Vehicle:
Value: 1112 mg/kg bw
Method:
Year: GLP:
Test substance: as prescribed by 1.1 - 1.4
Source: Akzo Nobel Chemicals GmbH Dueren

(79)

Type: LD50
Species: rat
Strain:
Sex:
Number of Animals:
Vehicle:
Value: 1278 mg/kg bw
Method:
Year: GLP:
Test substance: as prescribed by 1.1 - 1.4
Remark: Unfasted rats were used.
Source: Akzo Nobel Chemicals GmbH Dueren

(80)

Type: LD50
Species: mouse
Strain:
Sex:
Number of Animals:
Vehicle:
Value: = 1350 mg/kg bw
Method: other: no especificado
Year: 1964 GLP: no data
Test substance: no data
Source: GENERAL QUIMICA, S.A. LANTARON COMUNION (ALAVA)

(81)

5.1.2 Acute Inhalation Toxicity

Type: LC50
Species: rat
Strain:
Sex:
Number of Animals:
Vehicle:
Exposure time: 4 hour(s)
Value: ca. 4.42 mg/l
Method: other: EPA/FIFRA u 81-3
Year: 1982 GLP: yes
Test substance: other TS: Thiram technical (99.5 % purity)
Remark: Clinical signs; activity decrease, constricted pupils,gasping, lacrimation, nasal discharge, pilo-erection, polyuria, ptosis, salivation.
Source: UCB CHEMICALS BRUSSELS

(82)

Type: LC50
Species: rat
Strain:
Sex:
Number of Animals:
Vehicle:
Exposure time: 4 hour(s)
Value: ca. 4.42 mg/l
Method: other: EPA/FIFRA par. 81-3
Year: 1982 GLP: yes
Test substance: other TS: Thiram technical (99.5% purity)
Remark: Clinical signs : activity decrease, constricted pupils, gasping, lacrimation, nasal discharge, pilo-erection, polyuria, ptosis, salivation.
Source: UCB-Chemicals Gent

(82)

Type: LC50
Species: rat
Strain:
Sex:
Number of Animals:
Vehicle:
Exposure time: 4 hour(s)
Value: = .5 mg/l
Method: other: sin especificar
Year: 1986 GLP: no data
Test substance: no data
Source: GENERAL QUIMICA, S.A. LANTARON COMUNION (ALAVA)

(83)

Type: LC50
Species: rat
Strain:
Sex:
Number of Animals:
Vehicle:
Exposure time: 4 hour(s)
Value: > .1 mg/l
Method: other
Year: 1985 GLP: yes
Test substance: as prescribed by 1.1 - 1.4
Remark: No deaths, some labored breathing, subsided in 16 hrs. No gross pathological abnormalities. Slight to severe inflammation in the lungs.
Note: A large difference in nominal (6.34 mg/l) and measured concentration (0.1 mg/l).
Nose only exposure
Source: Akzo Nobel Chemicals GmbH Dueren

(84)

Type: LC50
Species: rat
Strain:
Sex:
Number of Animals:
Vehicle:
Exposure time: 4 hour(s)
Value: 4.42 mg/l
Method: other
Year: 1987 GLP: no data
Test substance: as prescribed by 1.1 - 1.4
Remark: Whole body exposure
Source: Akzo Nobel Chemicals GmbH Dueren

(85)

Type: LC50
Species: rat
Strain:
Sex:
Number of Animals:
Vehicle:
Exposure time: 4 hour(s)
Value: .5 mg/l
Method: other
Year: 1986 GLP: no data
Test substance: no data
Source: Akzo Nobel Chemicals GmbH Dueren

(86)

Type: LC50
Species: rat
Strain:
Sex:
Number of Animals:
Vehicle:
Exposure time: 4 hour(s)
Value: > 2.63 mg/l
Method: other
Year: GLP: no data
Test substance: no data
Source: Akzo Nobel Chemicals GmbH Dueren

(87)

Type: LC50
Species: rat
Strain:
Sex:
Number of Animals:
Vehicle:
Exposure time: 4 hour(s)
Value: > 6.225 mg/l
Method:
Year: GLP:
Test substance: as prescribed by 1.1 - 1.4
Remark: 6.225 mg/l was the maximal attainable dust concentration which could be generated. At this concentration no deaths occurred.
Source: Akzo Nobel Chemicals GmbH Dueren

(79)

5.1.3 Acute Dermal Toxicity

Type: LD50
Species: rat
Strain:
Sex:
Number of Animals:
Vehicle:
Value: > 5000 mg/kg bw
Method: other: sin especificar
Year: 1990 GLP: no data
Test substance: no data
Source: GENERAL QUIMICA, S.A. LANTARON COMUNION (ALAVA)

(88)

Type: LD50
Species: rat
Strain:
Sex:
Number of Animals:
Vehicle:
Value: > 2000 mg/kg bw
Method: other
Year: 1985 GLP: yes
Test substance: as prescribed by 1.1 - 1.4
Remark: Study according to EPA-540/9-82-025, paragraph 81-2.
Source: Akzo Nobel Chemicals GmbH Dueren

(89) (77)

Type: LD50
Species: rat
Strain:
Sex:
Number of Animals:
Vehicle:
Value: > 5000 mg/kg bw
Method: other
Year: 1990 GLP: no data
Test substance: no data
Source: Akzo Nobel Chemicals GmbH Dueren
(90)

Type: LD50
Species: rat
Strain:
Sex:
Number of Animals:
Vehicle:
Value: > 5000 mg/kg bw
Method:
Year: GLP:
Test substance: as prescribed by 1.1 - 1.4
Source: Akzo Nobel Chemicals GmbH Dueren
(79)

Type: LD50
Species: rabbit
Strain:
Sex:
Number of Animals:
Vehicle:
Value: >= 2000 mg/kg bw
Method: other: EPA/FIFRA u 81-2
Year: 1982 GLP: yes
Test substance: other TS: Thiram technical (98.8 % purity)
Remark: Clinical signs : slight to moderate erythema.
Macroscopic examination : no findings
Source: UCB CHEMICALS BRUSSELS
(91)

Type: LD50
Species: rabbit
Strain:
Sex:
Number of Animals:
Vehicle:
Value: >= 2000 mg/kg bw
Method: other: EPA/FIFRA par. 81-2
Year: 1982 GLP: yes
Test substance: other TS: Thiram technical (98.8% purity)
Remark: Clinical signs : slight to moderate erythema.
Macroscopic examination : no findings.
Source: UCB-Chemicals Gent

(91)

Type: LD50
Species: rabbit
Strain:
Sex:
Number of Animals:
Vehicle:
Value: > 7940 mg/kg bw
Method: other
Year: GLP: yes
Test substance: as prescribed by 1.1 - 1.4
Source: Akzo Nobel Chemicals GmbH Dueren

(78)

Type: LDLo
Species: rabbit
Strain:
Sex:
Number of Animals:
Vehicle:
Value: = 1000 mg/kg bw
Method: other: sin especificar
Year: 1982 GLP: no data
Test substance: no data
Source: GENERAL QUIMICA, S.A. LANTARON COMUNION (ALAVA)

(92)

5.1.4 Acute Toxicity, other Routes

Type:	LD50
Species:	rat
Strain:	
Sex:	
Number of Animals:	
Vehicle:	
Route of admin.:	i.p.
Value:	= 138 mg/kg bw
Method:	otro(a)(s) : sin especificar
Year:	1978 GLP: no data
Test substance:	no data
Source:	GENERAL QUIMICA, S.A. LANTARON COMUNION (ALAVA)

(93)

Type:	LD50
Species:	mouse
Strain:	
Sex:	
Number of Animals:	
Vehicle:	
Route of admin.:	i.p.
Value:	= 70 mg/kg bw
Method:	otro(a)(s) : sin especificar
Year:	1982 GLP: no data
Test substance:	no data
Source:	GENERAL QUIMICA, S.A. LANTARON COMUNION (ALAVA)

(94)

Type:	LD50
Species:	rat
Strain:	
Sex:	
Number of Animals:	
Vehicle:	
Route of admin.:	s.c.
Value:	= 646 mg/kg bw
Method:	otro(a)(s) : sin especificar
Year:	1990 GLP: no data
Test substance:	no data
Source:	GENERAL QUIMICA, S.A. LANTARON COMUNION (ALAVA)

(95)

Type:
Species:
Strain:
Sex:
Number of
Animals:
Vehicle:
Route of admin.:
Value:
Method:
Year: GLP:
Test substance:
Remark: .
Source: Akzo Nobel Chemicals GmbH Dueren

5.2 Corrosiveness and Irritation

5.2.1 Skin Irritation

Species: rabbit
Concentration:

Exposure:
Exposure Time:
Number of
Animals:
PDII:
Result: not irritating
EC classificat.: not irritating
Method: other: EPA/FIFRA u 81-5
Year: 1982 GLP: yes
Test substance: other TS: Thiram technical (98.8 % purity)
Source: UCB CHEMICALS BRUSSELS
(96)

Species: rabbit
Concentration:

Exposure:
Exposure Time:
Number of
Animals:
PDII:
Result: not irritating
EC classificat.: not irritating
Method: other: EPA/FIFRA par. 81-5
Year: 1982 GLP: yes
Test substance: other TS: Thiram technical (98.8% purity)
Source: UCB-Chemicals Gent
(96)

Species: rabbit
Concentration:

Exposure:
Exposure Time:
Number of
Animals:
PDII:
Result: not irritating
EC classificat.: not irritating
Method: other
Year: 1985 GLP: yes
Test substance: as prescribed by 1.1 - 1.4
Remark: 4 hour application time.
Study according to EPA Guideline EPA-540/9-82-025, paragraph 81-5.
Source: Akzo Nobel Chemicals GmbH Dueren
(97)

Species: rabbit
Concentration:

Exposure:
Exposure Time:
Number of
Animals:
PDII:
Result: moderately irritating
EC classificat.: not irritating
Method: other
Year: 1982 GLP: no
Test substance: as prescribed by 1.1 - 1.4
Remark: 24 hour application time
Source: Akzo Nobel Chemicals GmbH Dueren
(98)

Species: rabbit
Concentration:

Exposure:
Exposure Time:
Number of
Animals:
PDII:
Result: slightly irritating
EC classificat.: not irritating
Method: Draize Test
Year: GLP: yes
Test substance: as prescribed by 1.1 - 1.4
Remark: Primary irritation index = 0.7.
The test material was applied on the skin for 24 hours.
Source: Akzo Nobel Chemicals GmbH Dueren
(99)

Species:
Concentration:

Exposure:
Exposure Time:
Number of
Animals:
PDII:
Result:
EC classificat.:
Method:
Year: GLP:
Test substance:
Remark: Puede causar eritema, urticaria y reacciones alérgicas o eczemas.
Source: GENERAL QUIMICA, S.A. LANTARON COMUNION (ALAVA)

5.2.2 Eye Irritation

Species: rabbit
Concentration:
Dose:
Exposure Time:
Comment:
Number of
Animals:
Result: irritating
EC classificat.: irritating
Method: other: EPA/FIFRA u 81-4
Year: 1982 GLP: yes
Test substance: other TS: Thiram technical (98.8 % purity)
Remark: Irritation symptoms were reversible within 15 days after dosing.
Source: UCB CHEMICALS BRUSSELS
(100)

Species: rabbit
Concentration:
Dose:
Exposure Time:
Comment:
Number of
Animals:
Result: irritating
EC classificat.: irritating
Method: other: EPA/FIFRA par. 81-4
Year: 1982 GLP: yes
Test substance: other TS: Thiram technical (98.8% purity)
Remark: Irritation symptoms were reversible within 15 days after dosing.
Source: UCB-Chemicals Gent
(100)

Species: rabbit
Concentration:
Dose:
Exposure Time:
Comment:
Number of Animals:
Result: moderately irritating
EC classificat.: irritating
Method: other: sin especificar
Year: 1972 GLP: no data
Test substance: no data
Remark: Dosis: 100mg/24 horas.
Source: GENERAL QUIMICA, S.A. LANTARON COMUNION (ALAVA)

(101)

Species: rabbit
Concentration:
Dose:
Exposure Time:
Comment:
Number of Animals:
Result: not irritating
EC classificat.: not irritating
Method: other
Year: 1985 GLP: yes
Test substance: as prescribed by 1.1 - 1.4
Source: Akzo Nobel Chemicals GmbH Dueren

(102)

Species: rabbit
Concentration:
Dose:
Exposure Time:
Comment:
Number of Animals:
Result: slightly irritating
EC classificat.: not irritating
Method: other
Year: GLP: yes
Test substance: as prescribed by 1.1 - 1.4
Remark: Draize score: 6.5 of 110
Source: Akzo Nobel Chemicals GmbH Dueren

(103)

5.3 Sensitization

Type:	Guinea pig maximization test
Species:	guinea pig
Number of Animals:	
Vehicle:	
Result:	ambiguous
Classification:	
Method:	other
Year:	1982 GLP: yes
Test substance:	as prescribed by 1.1 - 1.4
Remark:	Study according to Magnusson and Kligman, 1970. At 10% challenge treatment: 3 out of 10 animals showed a positive reponse. At 5% challenge concentration 1 out of 10 animals showed a positive response.
Source:	Akzo Nobel Chemicals GmbH Dueren

(104)

Type:	Split adjuvant test
Species:	guinea pig
Number of Animals:	
Vehicle:	
Result:	sensitizing
Classification:	sensitizing
Method:	OECD Guide-line 406 "Skin Sensitization"
Year:	1985 GLP: yes
Test substance:	as prescribed by 1.1 - 1.4
Remark:	40% positive reponse. Moderate sensitizer.
Source:	Akzo Nobel Chemicals GmbH Dueren

(105)

Type:	Split adjuvant test
Species:	guinea pig
Number of Animals:	
Vehicle:	
Result:	sensitizing
Classification:	sensitizing
Method:	other: EPA/FIFRA par. 81-6
Year:	1982 GLP: yes
Test substance:	other TS: Thiram 99-100% grade
Remark:	A moderate sensitizer (grade III) following Klingman (1966).
Source:	UCB-Chemicals Gent

(106)

Type: Split adjuvant test
Species: guinea pig
Number of Animals:
Vehicle:
Result: sensitizing
Classification: sensitizing
Method: other: EPA/FIFRA u 81-6
Year: 1982 GLP: yes
Test substance: other TS: Thiram 99-100 % grade
Remark: A moderate sensitizer (grade III) following Klingman (1966).
Source: UCB CHEMICALS BRUSSELS
(106)

Type:
Species:
Number of Animals:
Vehicle:
Result:
Classification:
Method:
Year: GLP:
Test substance:
Remark: Puede causar reacciones alérgicas en la piel de los seres humanos.
Source: GENERAL QUIMICA, S.A. LANTARON COMUNION (ALAVA)
(107)

5.4 Repeated Dose Toxicity

Species: rat Sex: male/female
Strain: other
Route of admin.: oral feed
Exposure period: 90 days
Frequency of treatment: continuous
Post. obs. period: not applicable
Doses: 50, 500 and 1000 ppm nominal
Control Group: yes
NOAEL: ca. 2.5 mg/kg bw
Method: other: EPA/FIFRA u 82-1
Year: 1982 GLP: yes
Test substance: other TS: Thiram technical (99.4 % purity)
Result: Body weights, cumulative body-weight gains, and food consumption were significantly reduced throughout the study for both sexes at 500 and 1000 ppm.

Changes in clinical chemistry and haematological parameters occurred at dose levels of 500 and 1000 ppm. The changes considered to be treatment-related were reduced red blood cell count, haemoglobin and haematocrit in females ; increased MCV and MCH in both sexes; increased

white blood cell, corrected white blood cell, absolute neutrophil, absolute lymphocyte and absolute monocyte counts in females; reduced total protein and glucose in both sexes; reduced albumin and increased urea nitrogen and chloride in females.

At 500 and 1000 ppm animals a tendency to reduced terminal body-weights with correspondingly reduced absolute organ weights and increased organ to body-weight ratios were observed.

Macroscopically, the non-glandular stomach in some animal showed areas of erosion and the mesenteric lymph nodes were diffusely red or mottled. Microscopically, the mucosa of the nonglandular stomach had focal areas of erosion/ulceration, mucosal hyperplasia, or both, accompanied by some submucosal inflammation and edema. These changes appeared to be treatment-related. The mesenteric lymph nodes were frequently congested but otherwise normal.

Source: UCB CHEMICALS BRUSSELS

(108)

Species: rat Sex: male/female
Strain: other
Route of admin.: oral feed
Exposure period: 90 days
Frequency of treatment: continuous
Post. obs. period: not applicable
Doses: 50, 500 and 1000 ppm nominal
Control Group: yes
NOAEL: ca. 2.5 mg/kg bw
Method: other: EPA/FIFRA par. 82-1
Year: 1982 GLP: yes
Test substance: other TS: Thiram technical (99.4% purity)
Result: Body weights, cumulative body-weight gains, and food consumption were significantly reduced throughout the study for both sexes at 500 and 1000 ppm.

Changes in clinical chemistry and haematological parameters occurred at dose levels of 500 and 1000 ppm. The changes considered to be treatment-related were reduced red blood cell count, haemoglobin and haematocrit in females; increased MCV and MCH in both sexes; increased white blood cell, corrected white blood cell, absolute neutrophil, absolute lymphocyte and absolute monocyte counts in females,; reduced total protein and glucose in both sexes; reduced albumin and increased urea nitrogen and chloride in females.

At 500 and 1000 ppm animals a tendency to reduced terminal body-weights with correspondingly reduced absolute organ weights and increased organ to body-weight ratios were

observed.

Macroscopically, the non-glandular stomach in some animal showed areas of erosion and the mesenteric lymph nodes were diffusely red or mottled. Microscopically, the mucosa of thenonglandular stomach had focal areas of erosion/ulceration, mucosal hyperplasia, or both, accompanied by some submucosalinflammation and edema. These changes appeared to be treatment-related. The mesenteric lymph nodes were frequently congested but otherwise normal.

Source: UCB-Chemicals Gent

(108)

Species: rat Sex: male
Strain: other: Charles River
Route of admin.: oral feed
Exposure period: 13 weeks
Frequency of treatment: daily
Post. obs. period:
Doses: 0, 0.05, 0.1 or 0.25 %
Control Group: yes
Method:
Year: GLP:
Test substance:
Remark: At all dose groups significant reductions in body weight and feed consumption were observed. In the medium dose group a slight increase in blood urea was observed, and in the high dose group there was an increase in the activity of aspartate aminotransferase and alanine amino transferase and moderate tubular degeneration of the testes.
Source: Akzo Nobel Chemicals GmbH Dueren

(109)

Species: rat Sex: male/female
Strain: Fischer 344/DuCrj
Route of admin.: oral feed
Exposure period: 13 weeks
Frequency of treatment: daily
Post. obs. period:
Doses: 0, 0.015, 0.03 or 0.06 %
Control Group: yes
NOAEL: .03 %
Method: other
Year: GLP: no data
Test substance:
Remark: Increased liver enzyme (LDH, SGOT, SGPT) levels wer noted in the high exposure animals of both sexes, but females only showed slight histopatholigical changes in the lever.
Source: Akzo Nobel Chemicals GmbH Dueren

(110)

5.5 Genetic Toxicity 'in Vitro'

Type: Ames test
System of testing: Salmonella typhimurium strains TA1537, TA97, TA1538 TA98, TA1535 and TA100.
Concentration: 1-50 ug/plate
Cytotoxic Conc.:
Metabolic activation: with and without
Result: positive
Method: other
Year: 1982 GLP: no
Test substance: other TS
Remark: The majority of literature and company reports on Ames Salmonella assays have shown mutagenic activity.
References:
Lijinsky, W. (1984). Induction of tumors of the nasal cavity in rats by concurrent feeding of thiram and sodium nitrite. J. Toxicol. Environ. Health. 13, 609-614.

Monsanto study BO-76-277.

Uniroyal study (1982).

Goodyear study (1989). Only positive in TA1535 with S9-mix.

Moriya, M. et al. (1983). Further mutagenicity studies on pesticides in bacterial reversion assay systems. Mut. Res., 116, 185-216.

Rannug, A. et al. (1984). Genotoxic effects of additives in synthetic elastomers with special consideration to the mechanism of action of thiurams and dithiocarbamates. prog. Clin. Bio. Res. 141, 407-419.

Rannug, A. and Rannug. U. (1984). Enzyme inhibition as possible mechanism of the mutagenicity of thiocarbamic acid derivatives in Salmonella typhimurium. Chem. Biol. Interact. 49, 329-340.

Hedenstedt, A. et al. (1979). Mutagenicity and metabolism studies on 12 thiuram and dithiocarbamate compounds used as accelerators in the Swedish rubber industry. Mut. Res. 68, 313-325.

Zdzienicka, M. et al. (1979). Mutagenic activity of thiram in Ames tester strains of Salmonella typhimurium. Mut. Res. 68, 9-13.
Source: Akzo Nobel Chemicals GmbH Dueren
Test substance: Test substance stated to be 98% A.I. material

(111)

Type: Ames test
System of testing: S.typhimurium
Concentration: 50 ug/placa
Cytotoxic Conc.:
Metabolic activation: with
Result: negative
Method: other: sin especificar
Year: 1979 GLP: no data
Test substance: no data
Source: GENERAL QUIMICA, S.A. LANTARON COMUNION (ALAVA)
(112)

Type: Cytogenetic assay
System of testing: Chinese Hamster Ovary cells
Concentration: 0.56, 1.8 and 5.6 ug/ml (without S-9 mix), 1.8, 5.6 and 18 ug/ml (with S-9 mix)
Cytotoxic Conc.:
Metabolic activation: with and without
Result: positive
Method: OECD Guide-line 473 "Genetic Toxicology: In vitro Mammalian Cytogenetic Test"
Year: 1985 GLP: yes
Test substance: as prescribed by 1.1 - 1.4
Remark: At 10 hour harvest time 6 fold increase in aberration frequency (chromatid type) both with and without activation. No assessment was made for potential cell cycle delay. Dose levels may have been too high. No check for pH or osmolality.
Source: Akzo Nobel Chemicals GmbH Dueren
(113)

Type: Cytogenetic assay
System of testing: Chinese Hamster Ovary cells
Concentration: 0.003-0.023 ug/ml without and 0.2-1.5 ug/ml with activation
Cytotoxic Conc.:
Metabolic activation: with and without
Result: negative
Method: other
Year: 1987 GLP: yes
Test substance: as prescribed by 1.1 - 1.4
Remark: Metabolic activation: Aroclor 1254 induced rat liver S-9 mix.
Harvest times: 16 hours (with S-9 mix) (because a cell cycle delay was observed, the cells were harvested at 16 hrs., in order to assure that all cells were evaluated during the first division methaphase). 10 hours (without S-9 mix)
Source: Akzo Nobel Chemicals GmbH Dueren
(114)

Type: Cytogenetic assay
System of testing: L5178Y mouse lymphoma cells
Concentration: 1.8 - 20 ug/ml
Cytotoxic Conc.:
Metabolic activation: with and without
Result: ambiguous
Method: other
Year: 1982 GLP: no
Test substance: other TS
Remark: Two other studies showing weak activity on L5178Y mouse lymphoma cells are reported.
Monsanto study BIO-77-324
Paik, S.G and Lee, S.Y. (1977). Genetic effects of pesticides in the maamalian cells. II. Mutagenesis in L5178Y cells and DNA repair induction. Tongmul. Hakhoe. Chi, 20, 159-168.
Unusual cell type
Cytotoxicity not well determined.
2 Hour exposure: Cytogenetic effects were observed at cytotoxic concentrations.
At 24 hour exposure to considerably lower concentrations did not show an increase in chromosomal aberrations.
Source: Akzo Nobel Chemicals GmbH Dueren
Test substance: 98% A.I. material was used.

(115)

Type: Cytogenetic assay
System of testing: Chinese hamster ovary cells (CHO)
Concentration: 0.003, 0.006, 0.012, 0.023, 0.2, 0.4, 0.8, 1.5 ug/plate
Cytotoxic Conc.:
Metabolic activation: with and without
Result: negative
Method: other: EPA/FIFRA par. 84-2
Year: 1982 GLP: yes
Test substance: other TS: Thiram technical (99.8% purity)
Source: UCB-Chemicals Gent

(116)

Type: Cytogenetic assay
System of testing: Chinese hamster ovary cells (CHO)
Concentration: 0.003, 0.006, 0.012, 0.023, 0.2, 0.4, 0.8, 1.5 ug/plate
Cytotoxic Conc.:
Metabolic activation: with and without
Result: negative
Method: other: EPA/FIFRA u 84-2
Year: 1982 GLP: yes
Test substance: other TS: Thiram technical (99.8 % purity)
Source: UCB CHEMICALS BRUSSELS

(116)

Type: Cytogenetic assay
System of testing: células germinales de ratón macho
Concentration: 80 mg/Kg
Cytotoxic Conc.:
Metabolic activation: no data
Result:
Method: other: sin especificar
Year: 1987 GLP: no data
Test substance: no data
Source: GENERAL QUIMICA, S.A. LANTARON COMUNION (ALAVA)
(117)

Type: Cytogenetic assay
System of testing: Linfocitos periféricos de sangre humana
Concentration: sin datos
Cytotoxic Conc.:
Metabolic activation: with and without
Result: positive
Method: other: sin especificar
Year: 1989 GLP: no data
Test substance: as prescribed by 1.1 - 1.4
Source: GENERAL QUIMICA, S.A. LANTARON COMUNION (ALAVA)
(118)

Type: DNA damage and repair assay
System of testing: Monolayer cultures of rat (Sprague Dawley) hepatocytes
Concentration: 0.005 ug/ml up to 1 mg/ml
Cytotoxic Conc.:
Metabolic activation: without
Result: negative
Method: other: acc. to Williams, G.M. 1977
Year: GLP: yes
Test substance: as prescribed by 1.1 - 1.4
Remark: At a level of 0.02 mg/ml and higher the test material was toxic to the hepatocytes. At lower concentrations no DNA repair was observed.
Source: Akzo Nobel Chemicals GmbH Dueren
(119)

Type: HGPRT assay
System of testing: médula de ratón
Concentration: 100mg/Kg
Cytotoxic Conc.:
Metabolic activation: no data
Result: positive
Method: other
Year: 1985 GLP: no data
Test substance:
Source: GENERAL QUIMICA, S.A. LANTARON COMUNION (ALAVA)

Type: HGPRT assay
System of testing:
Concentration:
Cytotoxic Conc.:
Metabolic activation:
Result:
Method:
Year: GLP:
Test substance:
Remark: One positive and one negative finding have been reported for the HGPRT locus in CHO cells.
Source: Akzo Nobel Chemicals GmbH Dueren
(120)

Type: Mammalian cell gene mutation assay
System of testing: V79 Chinese Hamster Cells
Concentration: 1 to 56 ug/ml culture medium
Cytotoxic Conc.:
Metabolic activation: with and without
Result: negative
Method: OECD Guide-line 476 "Genetic Toxicology: In vitro Mammalian Cell Gene Mutation Tests"
Year: 1986 GLP: yes
Test substance: as prescribed by 1.1 - 1.4
Remark: The test material was tested up to cytotoxic concentrations, without a significant increase in mutant frequency at any test concentration.
Confirmed with an independent repeat.
Source: Akzo Nobel Chemicals GmbH Dueren
(121)

Type: Mammalian cell gene mutation assay
System of testing: L5178Y mouse lyphoma cells
Concentration: 2.4 up to 20 ug/ml
Cytotoxic Conc.:
Metabolic activation: with and without
Result: ambiguous
Method: other
Year: 1982 GLP: no
Test substance: other TS
Remark: Method according to Clive, D. Mutation Research, 31, 17-29, 1975.
Results without metabolic activation: Cannot be evaluated because less than 10% cell survival in 2 of the 3 dosages. Concentrations used are too high.
Results with metabolic activation: a dose related increase in mutation frequency at the HGPRT-locus, no effect at the TK-locus
Source: Akzo Nobel Chemicals GmbH Dueren
Test substance: >98% A.I. material is used

(122)

Type: Mammalian cell gene mutation assay
System of testing: V79 Chinese hamster cells (checks on HGPRT locus)
Concentration: 1, 3.3, 5.6, 10, 18, 33, 56 ug/ml
Cytotoxic Conc.:
Metabolic activation: with and without
Result: negative
Method: other: EPA/FIFRA par. 84-2
Year: 1982 GLP: yes
Test substance: other TS: Thiram 99-100% grade
Source: UCB-Chemicals Gent

(123)

Type: Mammalian cell gene mutation assay
System of testing: V79 Chinese hamster cells (checks on HGPRT locus)
Concentration: 1, 3.3, 5.6, 10, 18, 33, 56 ug/ml
Cytotoxic Conc.:
Metabolic activation: with and without
Result: negative
Method: other: EPA/FIFRA u 84-2
Year: 1982 GLP: yes
Test substance: other TS: Thiram 99-100 % grade
Source: UCB CHEMICALS BRUSSELS

(123)

Type: Salmonella typhimurium reverse mutation assay
System of testing: S. Typhimurium strains TA1537, TA1538, TA98, TA1535 and TA100
Concentration: 1.0, 3.3, 10.0, 33.3, 66.6, 100.0, 333.3, 666.6, 1000.0 ug/plate
Cytotoxic Conc.:
Metabolic activation: with and without
Result: positive
Method: other: EPA/FIFRA par. 84-2
Year: 1982 GLP: yes
Test substance: other TS: Thiram technical (98.7% purity)
Source: UCB-Chemicals Gent

(124)

Type: Salmonella typhimurium reverse mutation assay
System of testing: S. Typhimurium strains TA1537, TA1538, TA98, TA1535 and TA100
Concentration: 1.0, 3.3, 10.0, 33.3, 66.6, 100.0, 333.3, 666.6, 1000.0 ug/plate
Cytotoxic Conc.:
Metabolic activation: with and without
Result: positive
Method: other: EPA/FIFRA u 84-2
Year: 1982 GLP: yes
Test substance: other TS: Thiram technical (98.7 % purity)
Source: UCB CHEMICALS BRUSSELS

(124)

Type: Unscheduled DNA synthesis
System of testing: primary culture of rat hepatocytes
Concentration: 0.03 up to 10 ug/ml
Cytotoxic Conc.:
Metabolic activation: without
Result: negative
Method: other
Year: 1985 GLP: yes
Test substance: as prescribed by 1.1 - 1.4
Remark: Independent repeat.
Source: Akzo Nobel Chemicals GmbH Dueren

(125)

Type: Unscheduled DNA synthesis
System of testing: primary culture of rat hepatocytes
Concentration: 0.03, 0.10, 0.3, 1.0, 3.0, 10.0 ug/plate
Cytotoxic Conc.:
Metabolic activation: without
Result: negative
Method: other: EPA/FIFRA par. 84-2
Year: 1982 GLP: yes
Test substance: other TS: Thiram 99-100% grade
Source: UCB-Chemicals Gent

(126)

Type: Unscheduled DNA synthesis
System of testing: primary culture of rat hepatocytes
Concentration: 0.03, 0.10, 0.3, 1.0, 3.0, 10.0 ug/plate
Cytotoxic Conc.:
Metabolic activation: without
Result: negative
Method: other: EPA/FIFRA u 84-2
Year: 1982 GLP: yes
Test substance: other TS: Thiram 99-100 % grade
Source: UCB CHEMICALS BRUSSELS

(126)

5.6 Genetic Toxicity 'in Vivo'

Type: Drosophila SLRL test
Species: Drosophila melanogaster Sex: male/female
Strain:
Route of admin.: oral feed
Exposure period: 6 días
Doses: 1,2,3,4, y 5 mg/ml
Result:
Method: other
Year: 1983 GLP: no data
Test substance: as prescribed by 1.1 - 1.4
Source: GENERAL QUIMICA, S.A. LANTARON COMUNION (ALAVA)

(127)

Type: Drosophila SLRL test
Species: Drosophila melanogaster Sex:
Strain:
Route of admin.:
Exposure period:
Doses: 100-10,000 ug/ml
Result:
Method:
Year: GLP: no data
Test substance:
Remark: Two studies both did not show increases in lethal mutations.
Source: Akzo Nobel Chemicals GmbH Dueren

(128)

Type: Mammalian germ cell cytogenetic assay
Species: mouse Sex: male
Strain: NMRI
Route of admin.: gavage
Exposure period: up to 48 hours after treatment
Doses: 0, 75, 250 and 750 mg/kg bw
Result:
Method: Directive 87/302/EEC, part B, p. 79 "Mutagenicity: - In vivo mammalian germ-cell cytogenetics"
Year: 1987 GLP: yes
Test substance: other TS: Thiram technical (99.7 % purity)
Result: negative
Source: UCB CHEMICALS BRUSSELS

(129)

Type: Mammalian germ cell cytogenetic assay
Species: mouse Sex: male
Strain: NMRI
Route of admin.: gavage
Exposure period: up to 48 hours after treatment
Doses: 0, 75, 250 and 750 mg/kg bw
Result:
Method: Directive 87/302/EEC, part B, p. 79 "Mutagenicity: - In vivo mammalian germ-cell cytogenetics"
Year: 1987 GLP: yes
Test substance: other TS: Thiram technical (99.7% purity)
Result: Negative
Source: UCB-Chemicals Gent

(129)

Type: Micronucleus assay
Species: mouse Sex: male/female
Strain: CD-1
Route of admin.: i.p.
Exposure period: 24, 48 and 72 hours after treatment
Doses: 377, 189 and 38 mg/kg
Result:
Method: other
Year: 1987 GLP: yes
Test substance: as prescribed by 1.1 - 1.4
Remark: No increase in micronuclei in male or female mice was found.
Source: Akzo Nobel Chemicals GmbH Dueren

(130)

Type: Micronucleus assay
Species: mouse Sex: male/female
Strain: CD-1
Route of admin.: i.p.
Exposure period: up to 72 hours after treatment
Doses: 38, 189 and 377 mg/kg bw; no positive controls
Result:
Method: other: EPA/FIFRA par. 84-2
Year: 1982 GLP: yes
Test substance: other TS: Thiram technical (99.8% purity)
Result: negative
Source: UCB-Chemicals Gent

(131)

Type: Micronucleus assay
Species: mouse Sex: male/female
Strain: CD-1
Route of admin.: i.p.
Exposure period: up to 72 hours after treatment
Doses: 38,189 and 377 mg/kg bw; no positive controls
Result:
Method: other: EPA/FIFRA u 84-2
Year: 1982 GLP: yes
Test substance: other TS: Thiram technical (99.8 % purity)
Result: negative
Source: UCB CHEMICALS BRUSSELS

(131)

Type: Somatic mutation assay
Species: mouse Sex: male/female
Strain: other: DBA, NMRI
Route of admin.: other: gavage (one application on day 9 of pregnancy)
Exposure period: from day 9 of pregnancy
Doses: 0, 75, 750 mg/kg bw (in females)
Result:
Method: OECD Guide-line 484 "Genetic Toxicology: Mouse Spot Test"
Year: 1986 GLP: yes
Test substance: other TS: Thiram technical (98.7 % purity)
Result: negative with test substance, positive with positive controls
Source: UCB CHEMICALS BRUSSELS

(132)

Type: Somatic mutation assay
Species: mouse Sex: male/female
Strain: other: DBA, NMRI
Route of admin.: other: gavage (one application on day 9 of pregnancy)
Exposure period: from day 9 of pregnancy
Doses: 0, 75, 750 mg/kg bw (in females)
Result:
Method: OECD Guide-line 484 "Genetic Toxicology: Mouse Spot Test"
Year: 1986 GLP: yes
Test substance: other TS: Thiram technical (98.7% purity)
Result: Negative with test substance, positive with positive controls.
Source: UCB-Chemicals Gent

(132)

5.7 Carcinogenicity

Species: rat Sex: male/female
Strain: CD-1
Route of admin.: oral feed
Exposure period: 104 weeks
Frequency of treatment: continuous
Post. obs. period: after treatment : nil
Doses: 0, 30, 150, 300 ppm in the diet; number of rats : 60/sex/group
Result:
Control Group: yes, concurrent no treatment
Method: other: EPA/FIFRA u 83-2 (a)
Year: 1982 GLP: yes
Test substance: other TS: Thiram technical (97.5 % purity)
Result:
- Antemortem possible material-related observations : swollen nose, soft feces, opaque eye in male rats; soft feces in female rats
- Likely no test material-related ophtalmic lesions were noted
- Survival statistically significantly higher for males given 300 ppm
- Mean body weights and cumulative body weight gain were

statistically significantly lower than those of the controls at 150 ppm and 300 ppm, but not at 30 ppm at week 104
- No consistent effect on food consumption at any level in males, no statistically significant effect on food consumption in females
- Blood picture affected at 150 ppm and 300 ppm in females
- No significantly increased incidence of carcinomas or adenomas in liver, thyroid or any other organ was noted at any of the dose levels tested with respect to the controls. However a statistically significant positive trend for hepatocellular and thyroid C-cell adenomas in both sexes, as well as for bile duct hyperplasia in females was evidenced. Extramedullary hematopoiesis in the liver of males at the medium and high dose, and of females at the high dose as well as steatosis of the pancreas in both sexes was noted
- No antemortem observations and no histopathological findings suggested test material-related neurotoxicity
- NOEL : 30 ppm corresponding to 1.46 (1.02 - 3.25) mg/kg b.w./day in males, and 1.80 (1.30 - 3.31) mg/kg b.w./day in females

Source: UCB CHEMICALS BRUSSELS

(133)

Species: rat Sex: male/female
Strain: CD-1
Route of admin.: oral feed
Exposure period: 104 weeks
Frequency of treatment: continuous
Post. obs. period: after treatment : nil
Doses: 0, 30, 150, 300 ppm in the diet; number of rats : 60/sex/group
Result:
Control Group: yes, concurrent no treatment
Method: other: EPA/FIFRA par. 83-2 (a)
Year: 1982 GLP: yes
Test substance: other TS: Thiram technical (97.5% purity)
Result:
- Antemortem possible material-related observations : swollen nose, soft feces, opaque eye in male rats; soft feces in female rats.
- Likely no test material-related ophtalmic lesions were noted.
- Survival statistically significantly higher for males given 300 ppm.
- Mean body weights and cumulative body weight gain were statistically significantly lower than those of the controls at 150 ppm and 300 ppm, but not at 30 ppm at week 104.
- No consistent effect on food consumption at any level in males, no statistically significant effect on food consumption in females.
- Blood picture affected at 150 ppm and 300 ppm in

females.
- No significantly increased incidence of carcinomas or adenomas in liver, thyroid or any other organ was noted at any of the dose levels tested with respect to the controls. However a statistically significant positive trend for hepatocellular and thyroid C-cell adenomas in both sexes, as well as for bile duct hyperplasia in females was evidenced. Extramedullary hematopoiesis in the liver of males at the medium and high dose, and of females at the high dose as well as steatosis of the pancreas in both sexes was noted.
- No antemortem observations and no histopathological findings suggested test material-related neurotoxicity.
- NOEL : 30 ppm corresponding to 1.46 (1.02 - 3.25) mg/kg b.w./day in males, and 1.80 (1.30 - 3.31) mg/kg b.w./day in females.

Source: UCB-Chemicals Gent

(134)

Species: rat Sex: male/female
Strain: Fischer 344
Route of admin.: oral feed
Exposure period: 104 semanas
Frequency of treatment: sin especificar
Post. obs. period: 8 semanas
Doses: 0.1 y 0.05 %
Result:
Control Group: no data specified
Method: other: sin especificar
Year: 1988 GLP: no data
Test substance: no data
Result: Negativo.
Source: GENERAL QUIMICA, S.A. LANTARON COMUNION (ALAVA)

(135)

Species: rat Sex: no data
Strain: no data
Route of admin.: oral feed
Exposure period: 1 año
Frequency of treatment: sin especificar
Post. obs. period: sin especificar
Doses: 108 mg/Kg
Result:
Control Group: no data specified
Method: other: sin especificar
Year: 1980 GLP: no data
Test substance: no data
Source: GENERAL QUIMICA, S.A. LANTARON COMUNION (ALAVA)

(136)

Species: rat Sex: male/female
Strain: Fischer 344
Route of admin.: oral feed
Exposure period: 2 year
Frequency of treatment: daily
Post. obs. period:
Doses: 500 ppm (o.o5% in the feed)
Result:
Control Group: yes, concurrent no treatment
Method: other
Year: 1984 GLP: no data
Test substance: no data
Remark: Study from the National Cancer Institute.
In animals treated with the test substance alone no increase in tumours was noted.
When the animals were fed 500 ppm test substance and 2000 ppm sodium nitrite in their feed for 2 years, tumors of the nasal cavity were found.
Source: Akzo Nobel Chemicals GmbH Dueren

(137)

Species: rat Sex: male/female
Strain: Fischer 344
Route of admin.: oral feed
Exposure period: 104 weeks
Frequency of treatment: daily
Post. obs. period: 8 weeks
Doses: 0, 0.05 and 0.1% in the diet
Result:
Control Group: yes, concurrent no treatment
Method: other
Year: 1988 GLP: no data
Test substance: no data
Remark: No significant lesions or tumor induction attributable to the treatment were observed. Not carcinogenic.
Source: Akzo Nobel Chemicals GmbH Dueren

(138)

Species: mouse Sex: male/female
Strain: CD-1
Route of admin.: oral feed
Exposure period: 97 weeks
Frequency of treatment: continuous
Post. obs. period: after treatment : nil
Doses: 0, 15, 150, or 300 ppm (males) and 0, 15, 300, or 600 ppm (females). Number of mice : 50/sex/group
Result:
Control Group: no
Method: other: EPA/FIFRA u 83-2 (b)
Year: 1982 GLP: yes
Test substance: other TS: Thiram technical (97.5 % purity)
Result:

- No compound-related oncogenic effects noted up to 300 ppm in males (equal to 50 mg/kg b.w./day), and 600 ppm in females (equal to 112 mg/kg b.w./day)

- No adverse effects on survival, and no indication of neurotoxicity (based on clinical signs) were noted at any test level

- Decrease of body weight, weight gain and food consumption noted at the mid and high dose levels

- No remarkable clinical observations noted (however higher frequencies of sores or reddened areas noted at the high doses)

- Principal clinical haematology findings (decreased mean erythrocete count, haemoglobin, and haematocrit values) were noted in the 600 ppm females at termination

- No compound-related gross tissue alterations and no organ weight findings were noted

- Histopathology : no evidence of Thiram-induced neoplasia was shown. Further nonneoplastic effects were observed only at the mid and high doses

  Other effects : retinal atrophy, intracytoplasmic protein like droplets in the urinary bladder superficial transitional epithelium, and necrosis and suppurative inflammation in the skin at the mid and high doses; hyperkeratosis in the nonglandular stomach of the 300 ppm males, 300 and 600 ppm females; increased pigment in the spleen and decreased pigment in the inner adrenal cortex of the 300 and 600 ppm females

- NOEL for toxic effects was 15 ppm (equal to 3 mg/kg b.w./day)

Source: UCB CHEMICALS BRUSSELS

(139)

Species: mouse Sex: male/female
Strain: CD-1
Route of admin.: oral feed
Exposure period: 97 weeks
Frequency of treatment: continuous
Post. obs. period: after treatment : nil
Doses: 0, 15, 150 or 300 ppm (males) and 0, 15, 300 or 600 ppm (females).Number of mice : 50/sex/group
Result:
Control Group: yes, concurrent no treatment
Method: other: EPA/FIFRA par. 83-2 (b)
Year: 1982 GLP: yes
Test substance: other TS: Thiram technical (97.5% purity)
Result:

- No compound-related oncogenic effects noted up to 300 ppm in males (equal to 50 mg/kg b.w./day), and 600 ppm in females (equal to 112 mg/kg b.w./day)

- No adverse effects on survival, and no indication of neurotoxicity (based on clinical signs) were noted at any test level.

- Decrease of body weight, weight gain and food consumption noted at the mid and high dose levels.

- No remarkable clinical observations noted (however higher frequencies of sores or reddened areas noted at the high doses).

- Principal clinical haematology findings (decreased mean erythrocete count, haemoglobin and haematocrit values) were noted in the 600 ppm females at termination.

- No compound-related gross tissue alterations and no organ weight findings were noted.

- Histopathology : no evidence of Thiram-induced neoplasia was shown. Further nonneoplastic effects were observed only at the mid and high doses.

  Other effects : retinal atrophy, intracytoplasmic protein like droplets in the urinary bladder superficial transitional epithelium, and necrosis and suppurative inflammation in the skin at the mid and high doses; hyperkeratosis in the nonglandular stomach of the 300 ppm males, 300 and 600 ppm females; increased pigment in the spleen and decreased pigment in the inner adrenal cortex of the 300 and 600 ppm females.

- NOEL for toxic effects was 15 ppm (equal to 3 mg/kg b.w./day)

Source: UCB-Chemicals Gent

(139)

Species: mouse Sex: male/female
Strain: NMRI
Route of admin.: oral feed
Exposure period: 104 weeks
Frequency of treatment: daily
Post. obs. period:
Doses: 30, 100 or 300 ppm
Result:
Control Group: yes
Method:
Year: GLP: no data
Test substance: other TS
Remark: Result: no substance or dose-dependent increase in the number of tumours in treated animals was found compared to the controls. Not carcinogenic.
Source: Akzo Nobel Chemicals GmbH Dueren
Test substance: 99.6% pure material was used.

(140)

Species: Sex:
Strain:
Route of admin.:
Exposure period:
Frequency of treatment:
Post. obs. period:
Doses:
Result:
Control Group:
Method:
Year: GLP:
Test substance:
Remark: Groups of male and female mice were dosed Thiram at 10 mg/kg in gelatin at seven days of age by stomach tube and the same amount (not adjusted for increasing body weight) daily up to four weeks of age. Subsequently, the mice were given 26 mg/kg of diet daily up 78 weeks of age. No sign. increase of tumors of any type were found.

Groups of male and female mice were given single s.c. injections of 46.4 mg/kg thiram in 0.5 percent gelatin on day 28 of life. The animals were observed up to the age of 78 weeks. Tumor incidences were compared to controls and vehicle injected controls. No increase in tumors observed.

Reference: NTIS (1968). Evaluation of carcinogenic , teratogenic and mutagenic activities of selected pesticides and industrial chemicals. National Technical Information Service, 1. Carcinogenic Study, Washington DC, Department of Commerce.
Source: Akzo Nobel Chemicals GmbH Dueren

5.8 Toxicity to Reproduction

Type: Fertility
Species: rat Sex: no data
Strain: no data
Route of admin.: oral feed
Exposure Period: Días 7-12 de embarazo
Frequency of treatment: sin especificar
Duration of test: sin especificar
Doses: TDLo: 1200 mg/Kg
Control Group: no data specified
Method: other: sin especificar
Year: 1976 GLP:
Test substance:
Result: EFECTOS EN LA FERTILIDAD : Mortalidad pre y post-implantación, disminución del tamaño del feto.
Source: GENERAL QUIMICA, S.A. LANTARON COMUNION (ALAVA)
(141)

Type: One generation study
Species: rat Sex: no data
Strain: no data
Route of admin.: oral feed
Exposure Period: Día 15 de embarazo
Frequency of treatment: sin especificar
Duration of test: sin especificar
Doses: TDLo: 300 mg/Kg
Control Group: no data specified
Method: other: sin especificar
Year: 1978 GLP: no data
Test substance: no data
Result: Fetotoxicidad, mortalidad fetal y anormalidades en el desarrollo.
Source: GENERAL QUIMICA, S.A. LANTARON COMUNION (ALAVA)
(142)

Type: One generation study
Species: rat Sex: no data
Strain: no data
Route of admin.: oral feed
Exposure Period: Días 16-22 de embarazo
Frequency of treatment: sin especificar
Duration of test: sin especificar
Doses: TDLo: 1190 mg/Kg
Control Group: no data specified
Method: other: sin especificar
Year: 1976 GLP: no data
Test substance: no data
Result: Efectos en la primera generación relacionados con el crecimiento (p.e.: reducción de la ganancia de peso).
Source: GENERAL QUIMICA, S.A. LANTARON COMUNION (ALAVA)
(143)

Type: One generation study
Species: rat Sex: no data
Strain: no data
Route of admin.: oral feed
Exposure Period: Días 1-22 de embarazo
Frequency of treatment: sin especificar
Duration of test: sin especificar
Doses: TDLo: 550 mg/Kg
Control Group: no data specified
Method: other: sin especificar
Year: 1976 GLP: no data
Test substance: no data
Result: Efectos en el comportamiento.
Source: GENERAL QUIMICA, S.A. LANTARON COMUNION (ALAVA)
(144)

Type: Two generation study
Species: rat Sex: male/female
Strain: CD-1
Route of admin.: oral feed
Exposure Period: 81 days continuously in F0 animals and 84 days continuously in F1 animals
Frequency of treatment: see above
Premating Exposure Period
male: F0 animals : treatment started at 63 days of age for 81 days (then mating)
female: F1 animals : treatment started at 22 days of age for 84 days (then mating)
Duration of test:
Doses: 0, 30, 60 and 180 ppm in the diet. Number of animals : 26/sex/group
Control Group: yes
Method: other: EPA/FIFRA u 83-4
Year: 1982 GLP: yes
Test substance: other TS: Thiram technical (97.6 % purity)
Result: Parental systemic toxicity :

- No mortalities or antemortem findings noted at any of the dose levels treated.

- Mean maternal b.w. and food consumption reduced :

  * in F0 females at 60 and 180 ppm during F1a gestation, at 180 ppm during F1b and F1c gestations, and the the relevant lactation periods

  * in F1 females at 180 ppm during F2a and F2b gestation and lactation periods

- Mean food consumption reduced in Fo males and females at 60 and 180 ppm

- NOEL : 30 ppm for the F1a mating (equal to 1.5 and

2.3 mg/kg b.w./day in males and females, resp.)

60 ppm for all subsequent matings

Filial systemic toxicity :

- Mean offspring b.w.'s reduced across both generations at 180 ppm

- NOEL : 60 ppm (equal to 3.8 and 5.1 mg/kg b.w./day in males and females, resp.)

Reproductive toxicity :

- Neither the male and female copulatority and fertility indices nor the gestation index were affected by treatment

- NOEL : 180 ppm (equal to 8.9 and 14 mg/kg b.w./day in males and females, resp.)

Developmental toxicity :

- Mean number of stillborn or live births unaffected by treatment in F1 or F2 litters

- Survival indices alike antemortem and necropsy findings unaffected by treatment for the F1 or F2 offspring.

- NOEL : 180 ppm (equal to 8.9 and 14 mg/kg b.w./day in males and females, resp.)

Source: UCB CHEMICALS BRUSSELS (145)

Type: Two generation study
Species: rat Sex: male/female
Strain: CD-1
Route of admin.: oral feed
Exposure Period: 81 days continuously in F0 animals and 84 days continuously in F1 animals.
Frequency of treatment: see above
Premating Exposure Period
male: FO animals : treatment started at 63 days of age for 81 days (then mating)
female: F1 animals : treatment started at 22 days of age for 84 days (then mating)
Duration of test:
Doses: 0, 30, 60 and 180 ppm in the diet. Number of animals : 26/sex/group
Control Group: yes
Method: other: EPA/FIFRA par. 83-4
Year: 1982 GLP: yes
Test substance: other TS: Thiram technical (97.6% purity)

Result: Parental systemic toxicity :

- No mortalities or antemortem findings noted at any of the dose levels treated.
- Mean maternal b.w. and food consumption reduced :
  * in F0 females at 60 and 180 ppm during F1a gestation, at 180 ppm during F1b and F1c gestations, and the relevant lactation periods.
  * in F1 females at 180 ppm during F2a and F2b gestation and lactation periods.
- Mean food consumption reduced in Fo males and females at 60 and 180 ppm.
- NOEL : 30 ppm for the F1a mating (equal to 1.5 and 2.3 mg/kg b.w./day in males and females, resp.)

  60 ppm for all subsequent matings.

Filial systemic toxicity :

- Mean offspring b.w.'s reduced across both generations at 180 ppm.
- NOEL : 60 ppm (equal to 3.8 and 5.1 mg/kg b.w./day in males and females, resp.)

Reproductive toxicity :

- Neither the male and female copulatority and fertility indices not the gestation index were affected by treatment.
- NOEL : 180 ppm (equal to 8.9 and 14 mg/kg b.w./day in males and females, resp.)

Developmental toxicity :

- ... indices not the gestation index were affected by treatment.
- NOEL : 180 ppm (equal to 8.9 and 14 mg/kg b.w./day in males and females, resp.)

Developmental toxicity :

- Mean number of stillborn or live births unaffected by treatment in F1 or F2 litters.
- Survival indices alike antemortem and necropsy findings unaffected by treatment for the F1 and F2 offspring.

- NOEL : 180 ppm (equal to 8.9 and 14 mg/kg b.w./day in males and females, resp.)

Source: UCB-Chemicals Gent

(145)

Type:
Species: Sex:
Strain:
Route of admin.:
Exposure Period:
Frequency of treatment:
Duration of test:
Doses:
Control Group:
Method:
Year: GLP:
Test substance:

Remark: No effects on reproduction were seen in three generations of rats fed 48 mg/kg/day in the diet (1).

TMTD was administered to rats at 0, 0.05, 0.1, 0.5, 1.0, 5.0 or 25 mg/kg/day for six months. No effects on reproductive activity were reported (2). In a study were females were given 25 mg thiram/kg daily throughout preganancy, symptoms of maternal toxicity were observed, but no effects on reproduction. (2).

Rats were fed diets containing TMTD for 13 weeks prior to mating. Males treated at 132 mg/kg/day in the diet for 13 weeks failed to impregnate females. No effects were observed at 30 or 58 mg/kg/day.
Females rats fed at 30 or 96 mg/kg/day for 13 weekd=ks had reduced numbers of implants and viable embryos (3).

A series of further reproduction toxicity studies are mentioned cited in: BG Chemie, Toxicological evaluation 3, Potential Health Hazards of Existing Chemicals, Springer Verlag. Germany.

Source: Akzo Nobel Chemicals GmbH Dueren

(146)

Type:
Species: Sex:
Strain:
Route of admin.:
Exposure Period:
Frequency of treatment:
Duration of test:
Doses:
Control Group:
Method:
Year: GLP:
Test substance:
Remark: TMTD was administered to rats at 0, 0.05, 0.1, 0.5, 1.0, 5.0 or 25 mg/kg/day for six months. No effects on reproductive activity was reported.
Vasilos, A.F. et al. (1978). The reproductive function of rats in acute and chronic intoxication with thiram. Gig. Sanit. 43, 637-640.
Source: Akzo Nobel Chemicals GmbH Dueren

5.9 Developmental Toxicity/Teratogenicity

Species: rat Sex: female
Strain: CD-1
Route of admin.: gavage
Exposure period: From day 6 to 15 inclusive of gestation
Frequency of treatment: once a day over exposure period
Duration of test: females were sacrificed on day 20 of gestation
Doses: 7.5, 15 and 30 mg/kg b.w./day
Control Group: yes, concurrent no treatment
NOAEL Maternalt.: 7.5 mg/kg bw
NOAEL Teratogen.: 7.5 mg/kg bw
Method: other: EPA/FIFRA u 83-3
Year: 1982 GLP: yes
Test substance: other TS: Thiram technical (99 % purity)
Result:

Dose (mg/kg)	Maternal effects	Litter responses/ foetal evaluation
7.5	Body weight gain marginally reduced during treatment, unaffected thereafter	Placental weight slightly affected; no foetal toxicity
15	Transient, slight loss of b.w. noted up to day 8 p.c. thereafter the b.w. gain was essentially unaffected	Placental weight and foetal weight slightly affected (however remained within background control range); incidence of foetuses with reduced 13th ribs slightly increased

			However incidence not dose-related.
	30	Transient loss of b.w. noted up to day 8 p.c., thereafter the b.w. gain was essentially unaffected	Foetal survival unaffected; foetal placental weiths reduced, incidence of foetuses with reduced 13th ribs slightly increased. However, incidence not dose-related

Source: UCB CHEMICALS BRUSSELS

(147)

Species: rat Sex: female
Strain: CD-1
Route of admin.: gavage
Exposure period: from day 6 to 15 inclusive of gestation.
Frequency of treatment: once a day over exposure period
Duration of test: females were sacrificed on day 20 of gestation
Doses: 7.5, 15 and 30 mg/kg b.w./day
Control Group: yes, concurrent no treatment
NOAEL Maternalt.: 7.5 mg/kg bw
NOAEL Teratogen.: 7.5 mg/kg bw
Method: other: EPA/FIFRA par. 83-3
Year: 1982 GLP: yes
Test substance: other TS: Thiram technical (99% purity)
Result:

Dose (mg/kg)	Maternal effects	Litter responses/ foetal evaluation
7.5	Body weight gain marginally reduces during treatment, unaffected thereafter.	Placental weight slightly affected; no foetal toxicity
15	Transient, slight loss of b.w. noted up to day 8 p.c. thereafter the b.w. gain was essentially unaffected.	Placental weight and foetal weight slightly affected (however remained within background control range); incidence of foetuses with reduced 13th ribs slightly increased. However, incidence not dose-related.
30	Transient loss of b.w. noted up to day 8 p.c. thereafter the b.w. gain was essentially unaffected.	Foetal survival unaffected, foetal placental weights reduced, incidence of foetuses with reduced 13th ribs slightly increased. However, incidence not dose-related.

Source: UCB-Chemicals Gent

(147)

Species: rat Sex: female
Strain: no data
Route of admin.: gavage
Exposure period: day 6 to 15 of gestation
Frequency of treatment: daily
Duration of test:
Doses: 7.5, 15 and 30 mg/kg/day
Control Group: no data specified
NOAEL Maternalt.: > 30 mg/kg bw
NOAEL Teratogen.: 7.5 mg/kg bw
Method: other
Year: 1987 GLP: no data
Test substance: other TS
Remark: Maternal toxicity: A slight temporary decrease in body weight gain was noted during some days of the treatment period.
Fetal effects: decrease in fetal weight and placental weight at 30 mg/kg/day. Increase in reduced 13th rib size at 15 and 30 mg/kg/day groups, however not dose related.
Source: Akzo Nobel Chemicals GmbH Dueren
Test substance: 99.8 % A.I. Test substance

(148)

Species: rat Sex: female
Strain: no data
Route of admin.: gavage
Exposure period: day 6-15 of gestation.
Frequency of treatment:
Duration of test:
Doses:
Control Group:
NOAEL Teratogen.: 90 mg/kg bw
Method:
Year: GLP: no data
Test substance: no data
Remark: No teratogenic effects were noted at 90 mg/kg/day. At 40 and 90 mg/kg/day reduced maternal weight gain and fetal body weight reductions were noted.
In the same article a study on mice is reported. Results: mice treated at 100 or 300 TMTD/kg on days 5 through 14 of gestation did not demonstrate embryotoxic or teratogenic effects.
Source: Akzo Nobel Chemicals GmbH Dueren

(149)

Species: mouse Sex: female
Strain: other: NMRI or SW
Route of admin.: gavage
Exposure period: day 6-17 of gestation
Frequency of treatment:
Duration of test: day 6-17 of gestation
Doses: 5-30 mg/day
Control Group:
NOAEL Teratogen.: 250 mg/kg bw
Method:
Year: GLP: no data
Test substance: no data
Source: Akzo Nobel Chemicals GmbH Dueren

(150)

Species: rabbit Sex: female
Strain: New Zealand white
Route of admin.: gavage
Exposure period: from day 6 to 19 inclusive of gestation
Frequency of treatment: once a day over exposure period
Duration of test: females were sacrificed on day 29 of gestation
Doses: 0, 1.0, 2.5 and 5.0 mg/kg b.w./day
Control Group: no
NOAEL Maternalt.: 5 mg/kg bw
NOAEL Teratogen.: 5 mg/kg bw
Method: other: EPA/FIFRA u 83-3
Year: 1982 GLP: yes
Test substance: other TS: Thiram technical (99.5 % purity)
Result:

Dose (mg/kg)	Maternal effects	Litter responses/ foetal evaluation
1	General condition and b.w. performance unaffected	
2.5	General condition and b.w. performance unaffected	Litter parameters, survival, growth and morphological development in utero unaffected
5	General condition unaffected; b.w. performance slightly reduced	

Source: UCB CHEMICALS BRUSSELS

(151)

Species: rabbit Sex: female
Strain: New Zealand white
Route of admin.: gavage
Exposure period: from day 6 to 19 inclusive of gestation
Frequency of treatment: once a day over exposure period
Duration of test: females were sacrificed on day 29 of gestation
Doses: 0, 1.0, 2.5 and 5.0 mg/kg b.w./day
Control Group: yes
NOAEL Maternalt.: 5 mg/kg bw
NOAEL Teratogen.: 5 mg/kg bw
Method: other: EPA/FIFRA par. 83-3
Year: 1982 GLP: yes
Test substance: other TS: Thiram technical (99.5% purity)

Result:

Dose (mg/kg)	Maternal effects	Litter responses/foetal evaluation
1	General condition and b.w. performance unaffected.	Litter parameters, survival, growth and morphological development in utero unaffected.
2.5	General condition and b.w. performance unaffected.	Litter parameters, survival, growth and morphological development in utero unaffected.
5	General condition and b.w. performance unaffected, slightly reduced.	Litter parameters, survival, growth and morphological development in utero unaffected.

Source: UCB-Chemicals Gent

(151)

Species: rabbit Sex: female
Strain: no data
Route of admin.: gavage
Exposure period: day 6 -19 of gestation
Frequency of treatment: once daily
Duration of test:
Doses: 1, 2.5 and 5 mg/kg/day
Control Group: no data specified
NOAEL Maternalt.: 1 mg/kg bw
NOAEL Teratogen.: > 5 mg/kg bw
Method: other
Year: 1987 GLP: no data
Test substance: other TS
Remark: At 5 mg/kg/day dose level the only effect noted was reduced body weight gain.
Source: Akzo Nobel Chemicals GmbH Dueren
Test substance: 99.7 % A.I. Material

(152)

Species: hamster Sex: female
Strain:
Route of admin.: oral unspecified
Exposure period: day 7-8 of gestation
Frequency of treatment:
Duration of test:
Doses: 125, 250 or 500 mg/kg
Control Group:
Method:
Year: GLP: no data
Test substance: no data
Remark: At 125 mg/kg, a slight increase in percent of fetuses with terata were noted. At 250 mg/kg and above, fetal mortality and percentage of fetuses with terata were notably increased. Note: high dosing regime.
Source: Akzo Nobel Chemicals GmbH Dueren

(153)

5.10 Other Relevant Information

Type: Distribution
Remark: El tetrametiltiuramdisulfuro es absorbido rápidamente a través del tracto intestinal y los pulmones y se distribuye amplimente a través del cuerpo.
Source: GENERAL QUIMICA, S.A. LANTARON COMUNION (ALAVA)

(154)

Type: Metabolism
Remark: Rats were fed a single dose of 14 C-Thiram (2 mg/kg) following administration of unlabelled Thiram at 2 mg/kg for 14 days, then were sacrificed at 96 hours following dosing.

Mean 14C recovery : 85 % (males), 93 % (females)

Absorption : >= 83 % of the dose

Distribution of radioactivity :

- in urine (ca. 35-40 %), feces (ca. 2-5%), expired air (ca.47-48 %) and tissues (ca. 2-3 % left after four days)

- tissues : highest concentrations in liver, blood cells and kidneys.

Source: UCB CHEMICALS BRUSSELS

(155)

Type: Metabolism
Remark: Rats were fed a single dose of 14 C-Thiram (2 mg/kg) following administration of unlabelled Thiram at 2 mg/kg for14 days, then were sacrificed at 96 hours following dosing.

Mean 14C recovery : 85% (males), 93% (females)

Absorption : >= 83% of the dose.

Distribution of radioactivity :
- in urine (ca. 35-40%), feces (ca. 2-5%), expired air (ca. 47-48%) and tissues (ca. 2-3% left after four days).

- tissues : highest concentrations in liver, blood cells and kidneys.

Source: UCB-Chemicals Gent

(155)

Type: Metabolism
Remark: En estudios realizados con maíz tratado con tiram como alimento en rumiantes, los microorganismos propios de los rumiantes degradaron el tiram a sulfuro de carbono y probablemente a sulfuro de hidrógeno y dimetilamina. Se observó tiram sin metabolizar en heces y orina.
Source: GENERAL QUIMICA, S.A. LANTARON COMUNION (ALAVA)

(156)

Type: Metabolism
Remark: El metabolito principal en plantas es etilentiourea, seguido de etilen monosulfuro y probablemente etilentiuram disulfuro y azufre.
Source: GENERAL QUIMICA, S.A. LANTARON COMUNION (ALAVA)

(157)

Type: Metabolism
Remark: Se ha observado intolerancia al alcohol en los trabajadores expuestos al tiram, debido probablemente al bloqueo de la oxidación de la acetaldehido.
Source: GENERAL QUIMICA, S.A. LANTARON COMUNION (ALAVA)

(158)

Type: Metabolism
Remark: En presencia de alcohol el tiram produce fuertes nauseas, vómitos y colapsos.
Source: GENERAL QUIMICA, S.A. LANTARON COMUNION (ALAVA)

(159)

Type: Neurotoxicity
Remark: Type : Neurotoxicity (90-day study)

Results :

Mortality : no incidence

500 ppm : body weight and food consumption depressed. Neurotoxicity findings (through FOB, motor activity, neuropathology) : no consistent evidence of neurotoxicity shwon overall (however, FOB affected slightly)
125 ppm : adverse effects on body weight, food consumption. However, less severe than with 500 ppm
Neurotoxicity : no findings noted
30 ppm : no toxic effects any kind

NOEL : (neurotoxicity) : 125 ppm
NOEL : (adult toxicity) : 30 ppm

Method : EPA/FIFRA u 82-5

Year : 1991

GLP : yes
Source: UCB CHEMICALS BRUSSELS
Test substance: Fifteen Sprague Dawley rats/sex/group were administered Thiram technical (98.8 % purity) in the diet at concentrations of 0, 30, 125 and 500 ppm. Animals were treated over a period of at least 90 days and euthanized during the fourteenth week of administration.

(160)

Type: Neurotoxicity
Remark: Type : Neurotoxicity (90-day study)

Results :

Mortality : no incidence

500 ppm : body weight and fgood consumption depressed. Neurotoxicity findings (through F0B, motor activity, neuropathology) : no consistent evidence of neurotoxicity shown overall (however, F0B affected slightly).
125 ppm : adverse effects on body weight, food consumption. However, less severe than with 500 ppm.
Neurotoxicity : no findings noted.
30 ppm : no toxic effects any kind.

NOEL : (neurotoxicity) : 125 ppm.
NOEL : (adult toxicity) : 30 ppm.

Method : EPA/FIFRA par. 82-5

Year : 1991

GLP : yes
Source: UCB-Chemicals Gent
Test substance: Fifteen Sprague Dawley rats/sex/group were administered Thiram technical (98.8% purity) in the diet at concentrations of 0, 30, 125 and 500 ppm. Animals were treated over a period of al least 90 days and euthanized during the fourteenth week of administration.

(161)

Type: Neurotoxicity
Remark: Se localizó degeneración axonal y demielinación secundaria en el nervio ciático en ratas expuestas al tiram. También se observaron cambios degenerativos en la espina dorsal como cromatolisis, picnosis y satelitosis de neuronas. El tiram administrado vía oral en la alimentación puede causar alopecia, metaplasia escamosa de la tiroides, infiltración de las grasas en el páncreas, atrofia de las células germinales de los testículos y malformaciones esqueléticas.
Source: GENERAL QUIMICA, S.A. LANTARON COMUNION (ALAVA)

(162)

Type: Toxicokinetics
Remark: The identification of thiram metabolites in urine was determined in 2 Charles River Crl : CDr(SD)BR rats/sex. The rats (approximately 5 weeks old) were fed diets containing 50 ppm unlabelled thiram for nine weeks followed by a single oral dose of 14c-thiram (purity 99 %). Samples of urine were collected over the first 24 hours after treatment termination and analyzed by HPLC.

Approximately 60 % of the administered radioactivity was recovered as expired CS2 and 30 % was found in the urine. Thiram was rapidly degraded to more polar products. Virtually no unchanged thiram was detected in the urine. Five urinary metabolites were detected by HPLC and were identified by mass spectrometry. The identified metabolites were an alanine derivative of CS2 (10 %); a glucuronide conjugate of dimethyldithiocarbamate (DDC) (20 %); a thiosulfenic acid (34 %); the methyl ester of DDC (6%); and an alanine conjugate (30 %). The presence of these polar conjugates demonstrates that the metabolic pathway involved a reduction of the disulphide bond and subsequent reactions of the thiol moiety to form oxidative and conjugative polar products.
Source: UCB CHEMICALS BRUSSELS

(163)

Type: Toxicokinetics
Remark: The identification of thiram metabolites in urine was determined in 2 Charles River Crl : CDr(SD)BR rats/sex. The rats (approximately 5 weeks old) were fed diets containing 50 ppm unlabelled thiram for nine weeks followed by a singleoral dose of 14C-thiram (purity 99%). Samples of urine were collected over the first 24 hours after treatment termination and analyzed by HPLC.

Approximately 60% of the administered radioactivity was recovered as expired CS2 and 30% was found in the urine. Thiram was rapidly degraded to more polar products. Virtually no unchanged thiram was detected in the urine. Five urinary metabolites were detected by HPLC and were identified by mass spectrometry. The identified metabolites were an alanine derivative of CS2 (10%) ; a glucuronide conjugate of dimethyldithiocarbamate (DDC) (20%); a thiosulfenic acid (34%); the methyl ester of DDC (6%); and an alanine conjugate (30%). The presence of these polar conjugates demonstrates that the metabolic pathway involved a reduction of the disulphide bond and subsequent reactions of the thiol moiety to form oxidative and conjugative polar products.

Source: UCB-Chemicals Gent

(164)

Type:

Remark: Increased number of abnormal sperm have been reported in mice given TMTD at 50 or 100 mg/kg ip. or 80, 200 or 320 mg/kg orally in three daily doses for ????? days. Zdzienicka, M. et al (1982). Thiram induced sperm-head abnormalities in mice. Mutat. Res. 102, 261. Hema Prasad, M. et al. (1987). The effect of thiram on the germ cells of male mice. Food. Chem. Toxicol. 25, 709-711.

Source: Akzo Nobel Chemicals GmbH Dueren

5.11 Experience with Human Exposure

Remark: En un grupo de 223 trabajadores (42 hombres y 181 mujeres), la mayoria de 20-50 años, encargados en la producción de tiram durante más de 3 años manifestaron irritacion ocular, tos, dolores torácicos, taquicardia, epistaxis, lesiones dérmicas, miocardiodistrofia, disfunción hepática y astenia, crecimiento de la glándula tiroidea y un caso de adenocarcinoma del tiroides.

Source: GENERAL QUIMICA, S.A. LANTARON COMUNION (ALAVA)

(165)

Remark: Tiram inhibió la síntesis del DNA en linfocitos humanos en vivo en un 65%.

Source: GENERAL QUIMICA, S.A. LANTARON COMUNION (ALAVA)

(166)

Remark: Cultivos en células KB3 humanas se expusieron in vitro a 0.5, 1, 2.5 y 10 ppm de tiram disuelto en acetona durante 30 minutos-3 horas. El efecto citotóxico se midió por el grado de inhibición de ATP. La sensibilidad de la célula KB3 fue equivalente a 0.1 ppm de tiram. La observación microscópica del efecto tóxico mostró una progresiva desorganización del citoplasma, seguida de una migración del material nuclear.

Source: GENERAL QUIMICA, S.A. LANTARON COMUNION (ALAVA)

(167)

Remark: Se ha comprobado que la exposición cutánea al tiram produce inhibición de la aldehido dehidrogenasa.
Source: GENERAL QUIMICA, S.A. LANTARON COMUNION (ALAVA)
(168)

Remark: Alcohol intolerance may result from exposure to dithiocarbamates.
Source: Akzo Nobel Chemicals GmbH Dueren

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(2) Base de datos CHEMTOX (1993).

(3) TRGS 900 - Grenzwerte in der Luft am Arbeitsplatz "Luftgrenzwerte" -, Stand November 1997

(4) INRS, Valeurs limites d'exposition professionnelle aux substances dangereuses en France, Cah. Notes Doc. 1988, 133, 691-706

(5) 54 FR 2920 (1/19/89).

(6) RTECS No. JO1400000

(7) Fachbereichstandard TGL 6528/02, Ausgabe Dezember 1987 (für Vulkanisationsbeschleuniger Thiuram)

Werkstandard CKBS 231, Ausgabe September 1982 (für Fungizid Thiram 80)

(8) UCB WL No. 07/85 (1985)

(9) MSDS Akzo Chemicals, 1992

(10) BG Chemie, Toxicological evaluations, 3, Potential Health Hazards of Existing Chemicals.

(11) Base de Datos: HSDB (1994).

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(15) UCB LPCD No. 150/85 (1985)

(16) UCB LPCD No. 78 (1983)

(17) UCB WL No. 04/85 (1985)
KUL LAB 722/85/MVB/bh (1985)

(18) UCB WL No. 04/85 (1985)
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(23) Graphical Exposure Modeling System. Fate of Atmospheric Pollutants (FAP) Data Base. Office of Toxic Substances. USEPA (1986).

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(26) Sandy loam soil was used.
Two studies with different exposure times were conducted.
Halflife: 17.2 days for the 11 day study
56.8 days for the 30 day study.

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Rep. no. CRL F91019, 1991
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7.1 End Point Summary

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7.2 Hazard Summary

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7.3 Risk Assessment

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